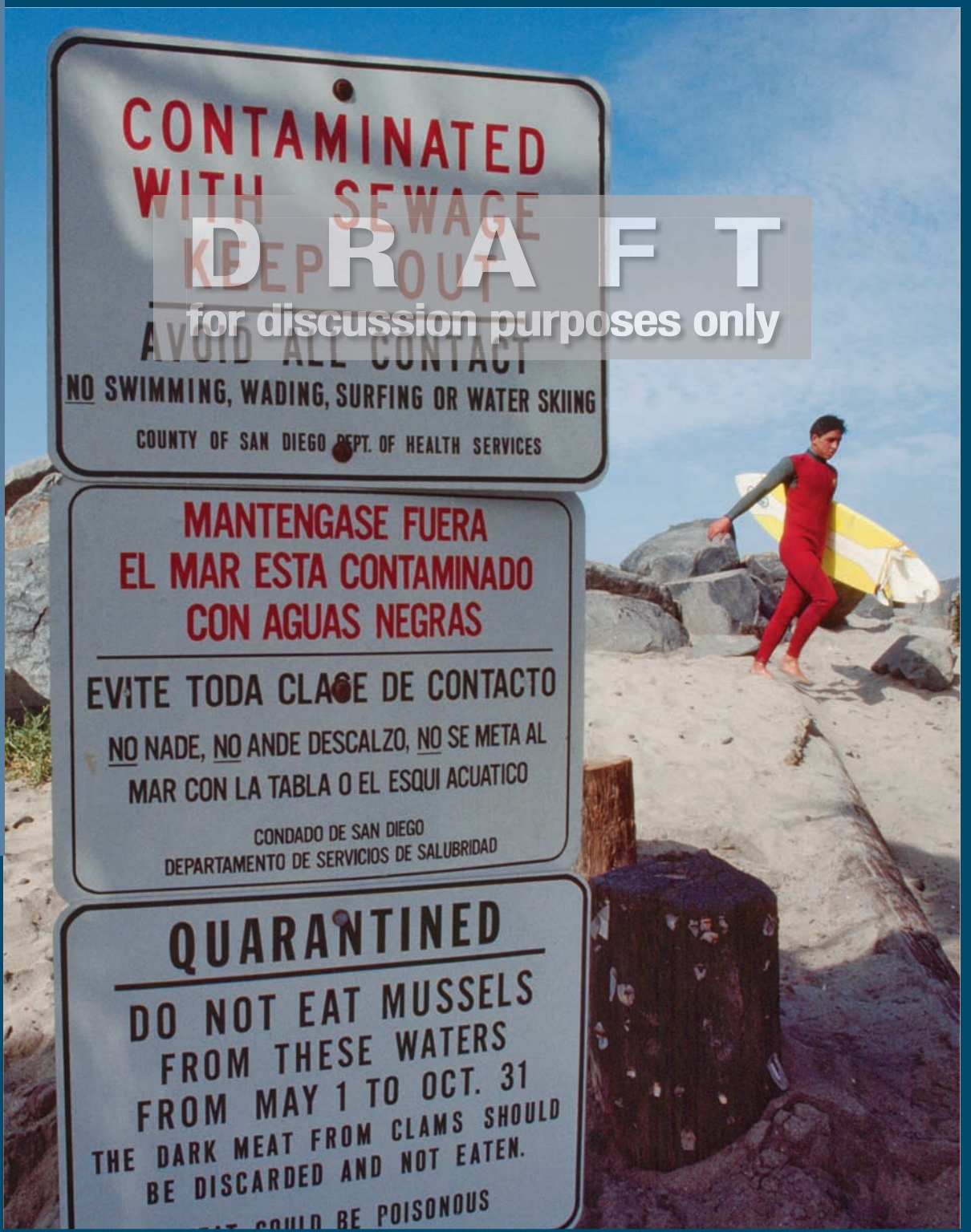
11

Teacher's Edition

California Education and the Environment Initiative

History-Social Science Standard 11.9.7.



United States and Mexico–Working Together

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California's Environmental Principles

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The State of California's Environmental Principles and Concepts were approved in 2004 under a law referred to as the California Education and the Environment Initiative (EEI). The law called for the development of Environmental Principles and Concepts that are compatible with the State's academic content standards and, as such, would become a formal part of California's K-12 education system. The EEI Curriculum, which this unit is part of, is designed to help students simultaneously achieve mastery of selected academic content standards and California's Environmental Principles and Concepts.

Principle I

People Depend on Natural Systems

The continuation and health of individual human lives
and of human communities and societies
depend on the health of the natural systems that provide essential goods
and ecosystem services.

Principle II

People Influence Natural Systems

The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems
are influenced by their relationships with human societies.

Principle III

Natural Systems Change in Ways that People Benefit from and Can Influence

Natural systems proceed through cycles

that humans depend upon, benefit from and can alter.

Principle IV

**There are no Permanent or Impermeable Boundaries
that Prevent Matter from Flowing Between Systems**

The exchange of matter between natural systems and human societies
affects the long-term functioning of both.

Principle V

**Decisions Affecting Resources and Natural Systems are Complex
and Involve Many Factors**

Decisions affecting resources and natural systems
are based on a wide range of considerations
and decision-making processes.

D R A F T
for discussion purposes only

California Education and the Environment Initiative

ACKNOWLEDGEMENTS

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California Environmental Protection Agency
California Integrated Waste Management Board
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Project Managers for the Education and the Environment Initiative:

Andrea Lewis, Assistant Secretary
Cal/EPA

Mindy Fox, Director
Office of Education and the Environment
California Integrated Waste Management Board

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CONTRIBUTORS

Author: **Jenny Pettit**
California Connections Author: **Lily Dayton**
Principal Consultant: **Dr. Gerald A. Lieberman**, Director, State Education and Environment Roundtable
Managing Editor: **Jennifer Rigby**, Director, The Acorn Group

Office of Education and the Environment
1001 I Street • Sacramento, California 95812 • (916) 341-6769
http://www.calepa.ca.gov/Education/EEI/

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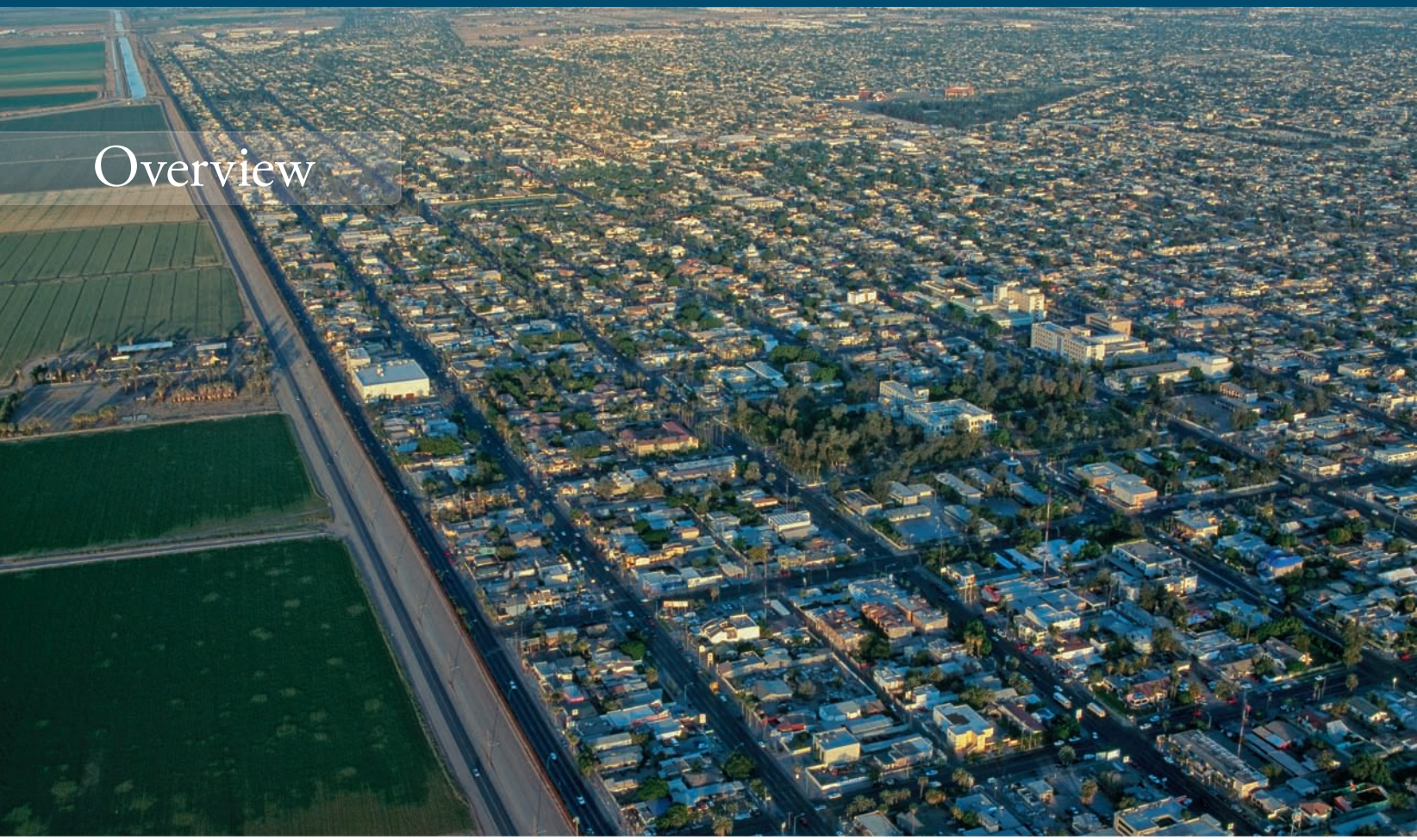
Overview



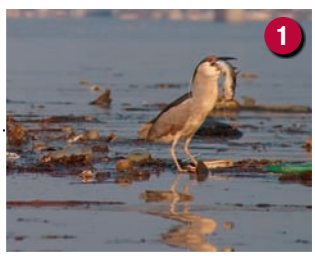
Mexicali, Mexico on the left and Calexico, California on the right

The borderland between the United States and Mexico is a dynamic region in which cultures and political systems collide and environmental issues cross political boundaries. This unit examines relations between the United States and Mexico by looking at key economic, political, and environmental issues.

The unit makes this extremely broad and complex topic accessible to students by focusing on the border region, where examples of these issues abound. The border region serves as the focus of study: it involves many environmental issues and stakeholders, and clearly shows the interconnectedness among social, political, economic, and environmental factors. Although this unit focuses on relations between the United States and Mexico in the twentieth century, students also examine current political, economic, and environmental issues that exist throughout the border region.

Students study various environmental problems, consider the regional influences of population

At a Glance



The Tijuana River: A Shared Resource
Brainstorm issues influencing U.S.-Mexico relations as related to the Tijuana River watershed.

Life on the Border
Analyze environmental problems in the borderlands and discuss their influence on U.S.-Mexico relations.

Population Pressures
Map population data and analyze infrastructure and economic opportunities in cities along the border.

California Content Standard

11.9. Students analyze U.S. foreign policy since World War II.

11.9.7. Examine relations between the United States and Mexico in the twentieth century, including key economic, political, immigration, and environmental issues.

California Environmental Principle V

Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes. As a basis for understanding this principle:

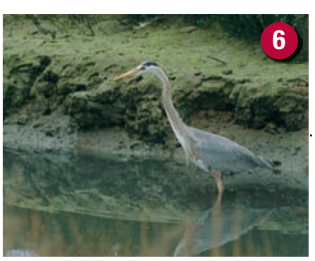
Concept A: Students need to know the spectrum of what is considered in making decisions about resources and natural systems and how those factors influence decisions.

growth, and analyze how economic and environmental issues influence the relationship between the United States and Mexico. In making decisions about natural resource use and management, both countries consider how such decisions influence the variety of people in the region, the diverse economies, and the complex social systems that are present in the area. Students also evaluate **treaties** and negotiations between the two countries that address these issues.

The lessons in the unit move students from identifying environmental factors and describing the different ways the stakeholders balance decisions, to analyzing the environmental treaties and agreements between the United States and Mexico. Students assess how population growth and density influence an area's natural resources and environmental health, how environmental factors permeate political boundaries, and how environmental issues influence the relationship between the countries. Within this unit, students analyze maps and statistical data to understand how the economy and **infrastructure** in the border region influence the environment and the full range of relations between the United States and Mexico. They also take on the roles of stakeholders in the Rio Grande region presenting their perspectives and concerns at a simulated conference. As a culminating activity, students analyze existing programs and treaties between the two countries aimed at regulating environmental issues. They apply what they have learned about the use and management of natural resources in the region to understand the complexities that arise when making decisions related to the economy and the environment.

From a Different Perspective
Take part in a simulated conference on water quality issues in the Rio Grande watershed.

International Agreements
Examine the environmental provisions of international agreements involving the United States and Mexico.



The Future of the Tijuana River
Discuss efforts to resolve cross-border environmental issues and their influence on U.S.-Mexico relations.

The Tijuana River Part 1: A Shared Resource

If you walk along the sand at Imperial Beach, along with gulls and sunbathers you are likely to see bleach bottles, plastic toys, hypodermic needles, tires, oil containers, or even a refrigerator door. You also might see a yellow sign that says *Keep Out! Sewage Contaminated Water. Exposure May Cause Illness.*

The San Diego County Department of Environmental Health closed the beach at the mouth of the Tijuana River for a total of 198 days in 2006. Environmental problems cross political borders at this special place where land, river, and ocean merge with two socially and economically disparate countries.

The Tijuana River is a trans-boundary watershed, with drainages running across the border between the United States and Mexico. Most of the river flows through Mexico, where it passes the cities of Tecate and Tijuana. It enters the United States 3 miles (4.8 kilometers) before draining into the Pacific Ocean. The river meets the sea at the protected Tijuana River National Estuarine Research Reserve. This diverse ecosystem lies at the junction of terrestrial, freshwater, and marine habitats. The reserve provides refuge for several threatened and endangered species.

Years ago, hiking upstream from the reserve, you might have been able to see dolphins and deer in the same day; however, those mammals are no longer found in the estuary.

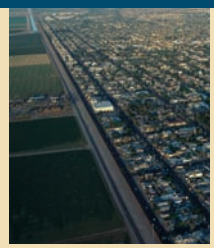
Today, human activities threaten the Tijuana River watershed, which is designated as a biodiversity hotspot and a "Wetland of International Importance." The area is home to many species with limited distribution or small populations that face immediate threat.

Experts think that Tijuana's current population of 1.5 million will double by 2020. San Diego's population will increase by 1.3 million. This rapid growth means that more people will need homes, water, and places to dispose of wastes. Rapid growth is a particular problem for Mexico because it lacks infrastructure like adequate facilities for wastewater.

Citizens of both countries move to the border region seeking work. Migration to the region has grown since the mid-1990s, when passage of the North American Free Trade Agreement (NAFTA) allowed the United States and Mexico to trade with limited tariffs. NAFTA led to an explosion in the number of *maquiladoras*—assembly plants. Many of these plants are American-owned factories, operating on the Mexican side of the border. There the owners can take advantage of Mexico's lower wages and more abundant labor supply, as well as less stringent enforcement of environmental regulations. Most of the profits from the *maquiladoras* flow back across the border to American and multinational corporations.

Money is not the only thing that flows across the border. The byproducts of manufacturing flow into the river. And, Mexico lacks the infrastructure, funds, and

Surfer on contaminated beach–Imperial Beach, California



environmental regulation to deal effectively with the industrial waste and toxic chemicals dumped on soil and into waterways. These toxins travel downstream, polluting both surface water and groundwater, as well as the coastal waters of the Pacific Ocean. Scientists have detected high levels of heavy metals in the river. As these metals move through food chains, they accumulate in the tissues of animals, including humans.

The growing need for housing is another problem resulting from economic growth in the region. Many housing developments have been built on crumbling hillsides above the river. Their construction has removed the vegetation that holds the hillsides in place. When rain falls, water runs off the concrete, rather than soaking into the ground. The resulting volume and velocity of water erode the hillsides and carry the soil into the river. This sediment load pulses into the river with each storm, choking the channel and threatening to bury the estuary in a layer of silt.

Wastewater Flowing–Los Laureles Canyon, Tijuana , Mexico

Sediment is not the only thing flushed downriver during a storm. Because Tijuana lacks adequate sewage treatment, with each rainstorm a million gallons of raw sewage overflow downstream from Tijuana. This enormous load of organic waste poses a human health problem. The torrents also sweep trash, plastics, and even discarded appliances into the river.

Debris overwhelms the border fence. The drainage gates in Smuggler's Gulch and Goat Canyon are open all the time, allowing the current to carry debris downstream, where it pollutes the estuary, litters the beach, and flows out to sea, causing even more problems. The water and sediment that flows into Goat Canyon is caught by large sedimentation basins at the head of the canyon on the U.S. side. The problems do not stem only from Mexico. Wastewater infrastructure in San Diego is old and in disrepair. Population growth in San Diego further stresses an overburdened system.

Environmental changes on one side of the border do not stay there. The river flows across the international border without regard to municipal infrastructures, and environmental and economic regulations. What enters the river upstream always flows downstream. Because of this, neither Mexico or the United States can solve these problems without working together.

The Tijuana River

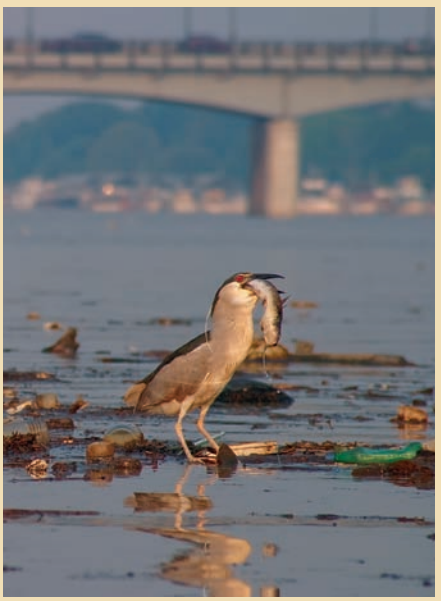
Part 2: Working Together to Find Solutions

In 2003, the mayors of Tecate and Tijuana became board members of the Tijuana River National Estuarine Research Reserve. The group aims to improve relations and management strategies on both sides of the river.

Researchers from both countries monitor water quality and wetland species. They propose ways to restore the health of the estuary. Restoration projects include constructing sedimentation basins that catch sediment and debris, as well as digging sediment from filled marshes and removing non-native plant species that threaten native plant communities. In addition, the Reserve runs a visitor center to educate the public. Representatives of the Reserve also work with Mexican agencies to train teachers on both sides of the border.

In 2006, the City of Tijuana and the State of California worked together to clean up Los Laureles Canyon. The canyon had become home to an unplanned housing development. The Mexican city and California created a sewage treatment plant and helped restore the natural waterway. They also organized riverbank cleanups. The U.S. Environmental Protection Agency also cooperates with many organizations in both the United States and Mexico to support wastewater projects in the area. The goal of these projects is maintaining the health of the border region. Recently, researchers from Mexican and U.S. universities developed a Tijuana River atlas. This atlas includes maps, photographs, and information about topography, climate, population, and land use in the Tijuana River watershed. Policymakers and planners in both countries can use this atlas to help make decisions. This binational project is a first step toward building communication and partnerships.

Current efforts to better manage the valuable resources of the Tijuana River are taking a "grassroots" approach. This means educating and working with people living in the watershed on both sides of the river. The goal is to give residents a sense of long-term stewardship, to encourage them to accept individual responsibility. Local outreach programs and restoration projects are underway in San Diego, Tecate, and Tijuana. These programs and projects encourage people to become aware of the issues that affect the river, as well as possible solutions. If the people of the Tijuana River watershed have the knowledge, tools, and support to co-exist with the natural environment, they will be able to make a difference on both sides of the border.



Heron eating fish in polluted river

Teacher's Background

Maquiladora or assembly plant

The United States and Mexico share a border that stretches 1,956 miles (3,148 kilometers) from Tijuana and San Diego on the western end to Matamoras and Brownsville on the east. The area 62 miles (100 kilometers) north and south of the U.S.-Mexico border is defined as the border region.

Its varied geography of deserts, mountains, and wetlands makes this region physically diverse. The region is also culturally diverse. Through history, various ethnic groups have come to the area for different, and often conflicting, reasons. Some families have immigrated to the area for economic reasons, some to live in the temperate climate, while indigenous peoples have lived there for centuries. Waves of immigration have created a population that is racially and ethnically diverse. The population growth in this region has also left its mark on the land and waterways belonging to both countries; it continues to influence decisions on how to use and manage the area's natural resources.

The distinctive social conditions of the border region have a history that stretches back to the mid-nineteenth century, but economic, demographic, and social pressures in Mexico, along with new laws and economic incentives in the United States have created a relatively new migration of people to this area. In particular, the success of the ***maquiladora*** program in northern Mexico is encouraging people to migrate to the border region for jobs. Maquiladoras are Mexican corporations that operate under a special program. Maquiladoras can be assembly plants, manufacturing facilities, food packing plants, or even call centers. Maquiladoras can be located pretty much anywhere in Mexico, not just the border region. Many U.S. companies have built plants on the Mexican side of the border to take advantage of cheaper, more abundant labor and less stringent environmental laws and enforcement.

While some migrants are attracted by the booming economy, many

others move to the region attracted by the inexpensive real estate market, mild climate, and opportunities for leisure activities.

Twelve million people currently inhabit the border region, and experts expect that number to double by 2025. The population pressures influence the arid environment of the region, especially in areas that lack important infrastructure and accessible resources, like water. This stress on the land and waterways sometimes creates political strain between the two nations as the United States and Mexico search for ways to manage the resources they "shared."

The key environmental issues that influence relations between the United States and Mexico specifically involve water quantity and quality, waste management, and air quality. These issues transcend the political border because they simultaneously influence all the communities in the region. For example, in parts of the Rio Grande **watershed**, factors such as population growth, the arid climate, groundwater depletion, and drought often create water shortages. Sharing river water and groundwater is difficult if the two nations do not communicate information about the quality and quantity of water that moves back and forth across the border. Both nations rely on the water in the shared watershed for industry, agriculture, and community maintenance. Over time, the quantity and quality of river water have decreased. Much of the groundwater has become highly saline partly due to mismanagement; the high level of salinity further limits the water's use. These circumstances make the increase in population even more of an issue in the border region. The lack of clean, potable water is influencing agricultural production and impacting human health, especially in the Rio Grande River Valley and the Colorado River Basin.

Waste management also influences the human and natural systems in the border region. The lack of municipal infrastructure in poorer communities on both sides of the border leads to illegal dumping of solid and hazardous waste. Raw sewage pollutes aquifers, surface water, and coastal water in areas where treatment facilities are absent or insufficient. The Texas Natural Resource Conservation Commission (TNRCC) reported that pollution of many areas along the Rio Grande with human fecal matter make the water unsafe for swimming, let alone for municipal use. Agricultural runoff and industrial solvents continue to affect the soil and water systems in the region. Much of the region employs outdated agricultural production techniques that influence the quality of the soil and water. As industry continues to increase along the border, so do industrial byproducts. Many of the maquiladoras located along the border use solvents, paints, and other chemicals whose use is illegal on the U.S. side of the border. While most of the *maquiladoras* are encouraged to dispose of these chemicals safely, some continue to discharge their waste directly into the soils and waterways. For example, the Arizona Department of Environmental Quality (ADEQ) has found high concentrations of uranium and sulfates in tailings from mining operations just a few miles from Nacos, Sonora, and Nacos, Arizona. These tailings sit on top of a **binational** aquifer used by communities on both sides of the border, and the people who live in the area are becoming concerned that the toxins will start showing up in their well water. While soils provide a valuable **ecosystem service** by absorbing some toxins before they can get into groundwater, soil that

Municipal worker clearing trash

Cars crossing the U.S.-Mexico border

becomes too contaminated ceases to function in this way.

Industrialization, urbanization, and transportation are influencing the air quality along the border. Byproducts from vehicles, power plants, and industrial factories take on the form of gases, liquid droplets, and solids. These gases and particulates can exist for long periods of time and travel long distances. Since air basins, like watersheds, go beyond political boundaries, air quality is a cross-border concern. While the point of origin is an important issue, the dispersal and detrimental consequences of air pollution on both sides of the border remain more immediate concerns.

Nonpoint source pollution (NPS), such as that caused by exhaust from vehicular traffic, has been increasing over the past 20 years as a result of population and economic growth. The growth in NPS pollution is especially notable in the larger urban communities of the border region, where travel between the two countries is on the rise. Diesel trucks used to transport goods to and from Mexico and the United States idle for hours at a time during border crossings. Idling vehicles are a major source of particulate matter that increases air pollution along the border and beyond.

Making decisions concerning the border region requires consideration of intertwined social issues. The rate of poverty in the border region is much higher than in other parts of the two nations. Three of the ten poorest counties in the United States are located in the border region, and the unemployment rate along the U.S. side of the Texas-Mexico border is 250 to 300% higher than in the rest of the country. In general, the communities on the Mexican side of the border have less access to clean water, electricity, and other infrastructure than the rest of Mexico. These economic pressures create needs that complicate oversight and management of the area's natural resources.

A variety of people with differing needs depend on and, in turn, influence the natural systems in this region. What results is a conflict of opinion on how to best use and manage the resources available. **Stakeholders** on both sides of the border have different ideas on how to balance the existing social, economic, political, and environmental concerns. The local communities, indigenous groups, and local governments are just as concerned about the issues as the federal agencies, non-governmental organizations (NGOs), and national leaders, but they sometimes weigh the issues and solutions differently. Nevertheless, all agree that the quality of the water, air, and soil is important to all people in the region.

In the twentieth century and already in the twenty-first century, the United States and Mexico have entered into several agreements that address the use and management of the shared natural systems found in the border region. **Trade liberalization** treaties between North American nations have forced the countries to deal with the environmental issues that are connected to the political and economic changes. Since the North American Free Trade Agreement (NAFTA) was established in 1993, observers in both countries recognize these environmental issues, and people working for federal governmental agencies in the United States and Mexico, local government agencies, NGOs, public officials, and indigenous groups have all been working together to analyze and evaluate the social, political, economic, and environmental issues in the border region.

Historically, the regulatory efforts of the United States and Mexico have been significantly different. The two countries' environmental laws are comparable, yet, due to economic and political factors, Mexico's enforcement of these laws has been less stringent than enforcement in the United States. The United States has more resources to conduct assessments of the environmental issues than does Mexico. Authorities

to date have done few such assessments in the Mexican states that are in the border region. This imbalance makes solving the border issues challenging, but not impossible. The Border Environmental Cooperation Commission (BECC) and the North American Development Bank (NADB), created as part of the NAFTA agreement, are specifically mandated to address the area's environmental health and fund projects to increase infrastructure on both sides of the border in order to improve and maintain a high quality of life. The "Border 2012 Program," a collaborative effort between U.S. and Mexico federal agencies, works to improve the environment along the border and protect the health of people living there by focusing on ways to clean the air, provide safe drinking water, reduce exposure to hazardous wastes, and prepare for emergencies. These major **treaties** and programs have helped to improve political relations between the United States and Mexico, while making headway in increasing the quality of human life and the health of the natural systems in the border region.

Since many of the solutions to environmental issues are not contained by political boundaries, to be most effective, the two nations must work together to address regulation and management of natural resources on both sides of the border. Maquiladoras operating on the Mexican side of the border, many of them owned by American corporations, provide jobs. However, if they dump hazardous wastes in the local community, it represents a problem for both nations. Those wastes eventually end up in the water and soil of communities in both Mexico and the United States. Similarly, the lack of sufficient infrastructure to manage sewage in San Diego has led to a decade of beach closures and damage to its local riparian and coastal ecosystems. The water and sediment in these affected ecosystems moves many miles up and down river valleys and the California coast. The environmental issues of the border region are rapidly, and for legitimate reasons, becoming issues of regional and international concern.

Officials from San Diego and Tijuana

Glossary

Binational: Involving two nations.

Ecosystem services: The functions and processes that take place in natural systems, such as pollination, that support or produce goods and help sustain human life, economies, and cultures.

Infrastructure: Fundamental facilities and systems, such as utilities, communications, and roads that serve a human community.

Maquiladora: Mexican corporations that operate under a special program. Maquiladoras can be assembly plants, manufacturing facilities, or even food packing plants or call centers.

Nonpoint source pollution: Pollution that comes from a wide range of sources rather than a single "point" such as a discharge pipe. Most nonpoint source pollution occurs as a result of runoff.

Stakeholders: Individuals, groups, or organizations that have an interest in or concern about a particular action or decision.

Trade liberalization: The decrease in trade barriers and tariffs to increase fair trade between countries.

Treaty: An agreement or protocol between two or more nations to create or restrict rights and responsibilities.

Watershed: The region of land that drains water into a particular watercourse or body of water.

Unit Planner

	Lesson	Learning Objective(s)	At a Glance
1	**The Tijuana River: A Shared Resource** **Preparation Time:** 15 min. **Instructional Time:** 55 min.	■ Identify key environmental issues that influence the relations between the United States and Mexico. ■ Provide examples of environmental impacts that are not contained by the political boundaries between the United States and Mexico.	Students brainstorm problems and issues that influence relations between the United States and Mexico. They read and discuss an article about the environmental issues involving the Tijuana River watershed and consider how these issues influence life in the border region.
2	**Life on the Border** **Preparation Time:** 20 min. **Instructional Time:** 55 min.	■ Identify key environmental issues that influence the relations between the United States and Mexico. ■ Provide examples of environmental impacts that are not contained by the political boundaries between the United States and Mexico.	Students read about environmental problems in the border region; locate on a map the areas where these problems are reported; and analyze how these problems are connected. Students discuss how environmental problems influence the relationship between the United States and Mexico.
3	**Population Pressures** **Preparation Time:** 20 min. **Instructional Time:** 55 min.	■ Recognize the influence of growing human populations in the United States and Mexico on the relationships between the countries and their decisions about the use and management of natural systems and the goods and ecosystem services they produce.	Students add population data to a map of the border region, analyze the infrastructure and economic opportunities in specific border cities, and consider the effects of population growth on the environmental problems discussed in previous lessons.
4	**From a Different Perspective** **Preparation Time:** 20 min. **Instructional Time:** 55-min. each, Session 1 and Session 2	■ Describe the difference between the two countries in terms of how each assesses and balances social, economic, political, and environmental factors in its decisions about the use and management of natural systems and the goods and ecosystem services they produce.	Students read about the Rio Grande and work in groups to prepare for a simulated conference. Students present the perspectives of various stakeholders concerned about water quality issues in the Rio Grande watershed and discuss the factors important to these stakeholders.

Prerequisite Knowledge

Students should know about:
- The general geography and location of the United States and Mexico.

Students should be able to:
- Read a map and locate places on a map.

Students should know about:
- Basic population dynamics.

Students should be able to:
- Read and interpret maps.
- Read and interpret statistical data and percentages.

Students should be able to:
- Write and present a brief speech on a selected topic.

All Materials Needed

Lesson Toolboxes identify lesson-specific needs.

Activity supplies:
- Self-adhesive notes (3"X3" or larger): three to five per student
- Maps of the U.S.-Mexico border
- Transparency markers: variety of colors for eight groups (Optional)
- Timer

A-V equipment:
- Overhead or LCD projector, screen

Class supplies:
- Markers, paper, pencils, pens, tape

Textbook Alignment

Prentice Hall: America Past and Present (2002) Pages 708-709, 714-715, 752, 794, 889, 984, 994

America Pathways to the Present, Modern American History (2005) Pages 908-911

America Pathways to the Present, Modern American History (2007) Pages 915, 917

Holt: American Nation in the Modern Era (2005) Pages 347-351, 509-511, 524, 813-815, 826-827

McDougal Littell: The American Pageant, Twelfth Edition PE Pages 1004, 1014, 1023-1024, 1026-1027, GB Pages 353-362, 402-420

The Enduring Vision, Fourth Edition PE Pages 618, 652, 741-742, 743a-743b, 751, 776, 835-836, 900, 928-929, 948-949, SG Pages v2 77, 112, 114, 126, 156, 189, 204, 207

The Americans: Reconstruction to the 21st Century (2003) Pages 662, 864, 885-886

Unit Planner

	Lesson	Learning Objective(s)	At a Glance
5	**International Agreement** **Preparation Time:** 15 min. **Instructional Time:** 55 min.	■ Identify treaties and conventions that regulate environmental issues shared by both the United States and Mexico.	Using a jigsaw approach, students learn about an international agreement, the environmental provisions in an international trade agreement, and a binational program designed to regulate environmental issues in the border region.
6	**The Future of the Tijuana River** **Preparation Time:** 15 min. **Instructional Time:** 55 min.	■ Identify key environmental issues that influence the relations between the United States and Mexico. ■ Provide examples of environmental impacts that are not contained by the political boundaries between the United States and Mexico.	Students read about several organizations' efforts to resolve environmental issues in the Tijuana River watershed. The class discusses these efforts in light of actions in the rest of the border region and examine how the efforts influence U.S.-Mexico relations.

Prerequisite Knowledge	All Materials Needed	Textbook Alignment
Students should have: ■ Completed previous lessons.		**Glencoe:** American Odyssey, the United States in the 20th Century (2004) Pages 623-624, 885, 888, 926 The American Republic Since 1877 (2005) SE Pages 903, 905 The American Vision (2005) SE Page 935 The American Vision Modern Times (2006) SE Pages 828-829, 943-944, 946 **AMSCO:** United States History Pages 631-632 Based on sample textbooks available at the time of production.
Students should have: ■ Completed previous lessons.		

English Language Development

Lessons in the EEI Curriculum are designed to support students' English language development. The strategies in these lessons are based on some of the practices identified in the Reading/Language Arts Framework for California Public Schools (California Department of Education 2007) and ideas adapted from the San Joaquin County Office of Education's Regional Technical Assistance Center.

To establish successful instructional strategies for all students, the teacher should:

- **Use a wide variety of ways to explain a concept or assignment.** When appropriate, the concept or assignment may be depicted in graphic or pictorial form, with manipulatives, or with real objects to accompany oral and written instructions.

- **Provide assistance in the specific and general vocabulary** prior to the each lesson, using reinforcement and additional practice afterward. Instructional resources and instruction should be monitored for ambiguities and language that could be confusing to students, such as idioms.

- **Ask each student frequently to communicate** his or her understanding of the concept or assignment. Students should be asked to verbalize or write down what they know, thereby providing immediate insight into their thinking and level of understanding. In addition, students should be encouraged to confer about each other's understanding of the concept being taught and the classwork or homework assignments, particularly if the students are not fully proficient in English.

- **Check frequently for understanding in a variety of ways.** When a student does not understand, analyze why.

- **Allow students to demonstrate their understanding and abilities** in a variety of ways while reinforcing modes of communication that are used on standardized tests.

- **Use pacing to differentiate instruction according to students' needs.** Reinforce the more difficult concepts for students experiencing difficulty in the language arts by providing additional time and using the visual aids provided. Accelerate the instructional pace for advanced learners if the assessments indicate mastery of the standard.

The California EEI Curriculum includes a variety of research-based English language development practices, such as:

Vocabulary Development

- Teach difficult vocabulary prior to and during the lesson
- Provide reading, speaking, and assessment tasks that reinforce new vocabulary

Reading Comprehension

- Use grade-level readers, articles, and reading assignments to build comprehension in the content area
- Engage students in meaningful interactions about text
- Provide activities that assess student comprehension and build decoding skills

Writing Strategies and Applications

- Provide opportunities for students to organize ideas and information in a written form including concept maps
- Use stories, articles and other written materials to model good writing
- Provide assessment tasks that allow students to apply their grade-level writing skills

Listening and Speaking Strategies and Applications

- Ask questions to ensure comprehension
- Elicit responses from all students, encourage students to give elaborate responses, and give students time to respond to questions
- Incorporate students' responses, ideas, examples, and experiences into the lesson
- Model and teach language patterns needed to understand and participate in the study of the content areas
- Encourage a high level of response accuracy
- Use visual aids, manipulatives, and real objects to support content delivery

The lessons in this unit can be used to support a variety of English language arts skills. This matrix summarizes how each of the lessons can be used to support English language development.

	V Vocabulary	R Reading	W Writing	L Listening	S Speaking
Lesson 1	✓	✓	✓	✓	✓
Lesson 2	✓	✓	✓	✓	✓
Lesson 3	✓	✓	✓	✓	✓
Lesson 4	✓	✓	✓	✓	✓
Lesson 5	✓	✓	✓	✓	✓
Lesson 6	✓	✓	✓	✓	✓

Differentiated Instruction

The 2007 Reading/Language Arts Framework for California Public Schools (California Department of Education 2007) provides guidance for helping students with diverse abilities succeed with California's English–Language Arts Content Standards. The instructional units developed for California's Education and the Environment Initiative provide ample opportunities for teachers to differentiate instruction to meet these needs.

It is important to take into account the State Board of Education's and Department of Education's guidance on differentiated instruction while implementing this instructional unit. Page 263 of the 2007 Framework summarizes this guidance as follows:

The diversity of California's students presents unique opportunities and significant challenges for instruction. Students come to school with a wide variety of skills, abilities, and interests as well as varying proficiency in English and other languages. The wider the variation of the student population in each classroom, the more complex becomes the teacher's role in organizing high-quality curriculum and instruction in the language arts and ensuring that each student has access according to the student's current level of achievement. The ultimate goal of language arts programs in California is to ensure access to high-quality curriculum and instruction for all students in order to meet or exceed the state's English–language arts content standards. To reach that goal, teachers need assistance in assessing and using the results of that assessment for planning programs, differentiating curriculum and instruction, using grouping strategies effectively, and implementing other strategies for meeting the needs of students with reading difficulties, students with disabilities, advanced learners, English learners, and students with combinations of special instructional needs.

Procedures that may be useful in planning for universal access are to:

- *Assess each student's understanding at the start of instruction and continue to do so frequently as instruction advances, using the results of assessment for program placement and planning.*
- *Diagnose the nature and severity of the student's difficulty and modify curriculum and instruction accordingly when students have trouble with the language arts.*
- *Engage in careful organization of resources and instruction and planning to adapt to individual needs. A variety of good teaching strategies that can be used according to the situation should be prepared.*
- *Differentiate when necessary as to depth, complexity, novelty, or pacing and focus on the language arts standards and the key concepts within the standards that students must master to move on to the next grade level.*
- *Employ flexible grouping strategies according to the students' needs and achievement and the instructional tasks presented.*
- *Enlist help from others, such as reading specialists, special education specialists, parents, aides, other teachers, community members, administrators, counselors, and diagnosticians when necessary and explore technology or other instructional devices or instructional materials, such as braille text, as a way to respond to students' individual needs.*

Additional information about best practices in differentiated instruction are detailed in Chapter 7 of the Framework.

Traditional Unit Assessment

Description

The United States and Mexico—Working Together (Traditional Unit Assessment Master) assesses the students' understanding of U.S.-Mexico relations with regard to shared environmental issues. Answers to the questions demonstrate students' understanding of the environmental issues and stakeholder perspectives in the border region, as well as the economic, political, social, and environmental factors that influence U.S.-Mexico relations.

Advanced Preparation

Prepare Traditional Unit Assessment Masters.

Suggested Scoring

Use the Answer Key provided on pages 22–25.

Point values for each question are listed on **The United States and Mexico—Working Together.** The total possible score is 50 points.

Preparation Time

10 min.

Assessment Time

55 min.

The United States and Mexico–Working Together

Traditional Unit Assessment Master | *page 1 of 4*

Name: _____

Section 1: Multiple Choice (2 points each)
Instructions: Select the best answer and circle the correct letter.

1. One of the biggest environmental issues in the border region influencing relations between the United States and Mexico is:
   a. construction of new housing along the border
   (b.) availability of potable water
   c. transportation of goods across the border
   d. the Tijuana River watershed

2. What is the main reason population is growing so quickly in the border region?
   a. The land is very cheap.
   (b.) There are jobs in new industries.
   c. The climate and resources are changing.
   d. The rivers have less water in them.

3. Which of these is not an environmental issue for border cities in both the United States and Mexico?
   (a.) median household income
   b. air quality
   c. availability of potable water
   d. industrial growth

4. The Colorado River is an important natural resource for both countries because:
   a. Pesticides used in surrounding agricultural production are dumped in the river.
   b. Goods from the maquiladoras are transported on the river.
   (c.) The river water is important for industry, agriculture, and municipal use.
   d. All of the above.

5. The Border 2012 Program provides a way for:
   (a.) stakeholders in the border region to work on environmental issues together
   b. federal agencies to control and manage the Mexico's natural resources
   c. the U.S. government to clean up the border immediately
   d. none of the above

Answer Key and Sample Answers

Name: _____

6. The main goal of the La Paz Agreement is to:
   a. pay for environmental projects in local communities
   b. enforce international environmental laws
   (c.) cooperate in addressing environmental issues in the border region
   d. increase the size of communities along the border

7. One of NAFTA's goals of is to:
   a. encourage population growth by increasing free trade
   b. enforce Mexican and U.S. environmental laws
   c. manage natural resources and national parks in both countries
   (d.) address environmental concerns related to industry in the border region

8. The Tijuana River watershed is an area in which there is binational cooperation on environmental issues because:
   a. The water in the river is running out.
   (b.) The health of the river affects both the United States and Mexico.
   c. Industries on both sides of the border influence the river.
   d. Cities on both sides of the border use the water in the river to drink.

9. Which of the following is not a factor that directly influences government decisions about natural resources in the border region?
   (a.) literacy rates
   b. job opportunities
   c. poverty
   d. human health

10. Which of the following will most likely have the biggest effect on the resources of the border region in the future?
    a. industrialization
    b. agriculture
    c. soil salinity
    (d.) population growth

Name: _____

Section 2: Short Answer (10 points each)
Instructions: In complete sentences, answer each of the following questions.

11. Describe one specific environmental issue in the border region, explain a problem related to that issue, and discuss how that problem influences relations between the United States and Mexico.

One major environmental issue in the border region is the quality of water. The problem is water pollution. Several factors have caused the pollution: population growth, pesticide use in agriculture, lack of treatment for wastewater, and other pollutants ending up in the water. This issue creates tension between the United States and Mexico because the two countries share much of the water. The issue also forces the two countries to assess the situation, educate communities, and work to restore the quality of water.

12. Choose two stakeholders in the border region who have different views on how to manage the natural resources in the region. Discuss the ways each stakeholder assesses and balances social, economic, and environmental factors when setting its goals.

The Kikapu are an indigenous group directly connected to environmental issues in the region. They believe in working communally on the land. However, since the Mexican government ended the ejido system, the Kikapu graze cattle on land they cannot afford to own. The Kikapu want a portion of the water in the Rio Grande to use for irrigation. Because they lack legal rights and representation, they do not have access to the water. The social and economic concerns of their community are at the forefront of their decisions.

The U.S. Fish and Wildlife Service has the goal of protecting and restoring natural systems affected by pollution in the region. The Fish and Wildlife Service is working to educate the population about the ecosystem services and the effects of human activities on the natural systems. They are also working on restoration projects to improve the ecosystems.

Answer Key and Sample Answers

The United States and Mexico–Working Together

Traditional Unit Assessment Master | *page 4 of 4*

Name: _____

13. Describe a particular treaty or agreement between the United States and Mexico related to improving the environment. Explain how the treaty or agreement influences life in the border region.

The Border 2012 Program is a binational agreement between the United States and Mexico. It encourages all of the stakeholders' involvement in solving problems in the border region. Stakeholders at the local, regional, and national level, including indigenous groups and colonia residents. They are working together to protect the environment and public health in the border region. The main goals are to reduce water contamination, air pollution, and land contamination and to increase emergency preparedness and environmental stewardship. Stakeholders are meeting some of their goals and still working toward others. They are meeting goals by assessing the environmental problems, analyzing the economic, political, and social factors at stake, educating the public, and establishing restoration projects.

Alternative Unit Assessment

Description

The **Environmental Problem Concept Map** (Alternative Unit Assessment Master) can be used in conjunction with, or in place of, the traditional unit assessment to demonstrate students' understanding of key issues related to U.S.-Mexico relations and the environmental issues that face the two countries.

In this assessment, students create a concept map that shows connections between an environmental issue and the various stakeholders concerned with the issue, population pressures, international treaties, and programs used to help manage the environmental issue. This alternative assessment can be completed in one class period by students working individually.

Advanced Preparation

Gather and prepare Materials Needed:

- All student work from Lessons 1 through 6, assessed by teacher.

Gather and prepare Alternative Unit Assessment Masters.

Suggested Scoring

Use the Answer Key and Sample Answers on pages 28–30 to assess students' diagrams.

Each question on **Environmental Problem Concept Map** is worth 10 points. The total possible score is 50 points.

Materials Needed

Alternative Unit Assessment Masters:

- **Environmental Problem Concept Map**
  SM, Page 7
  One per student

Preparation Time

15 min.

Assessment Time

60 min

Safety Notes

None

Procedures

Step 1

Explain that, to show what they have learned, students are to work individually to create a concept map of information about one of the environmental issues—water, air, or land/soil—in the border region. Direct students to use their notes, readings, and worksheets from all the lessons in the unit to help them complete their concept maps.

Step 2

Distribute copies of **Environmental Problem Concept Map** (Alternative Unit Assessment Master) to each student. Remind students that they are to address one of the following issues: water, air, or land/soil. They should write the issue they choose in the center of the concept map. Each part of the concept map should be filled in with information related to that issue.

Step 3

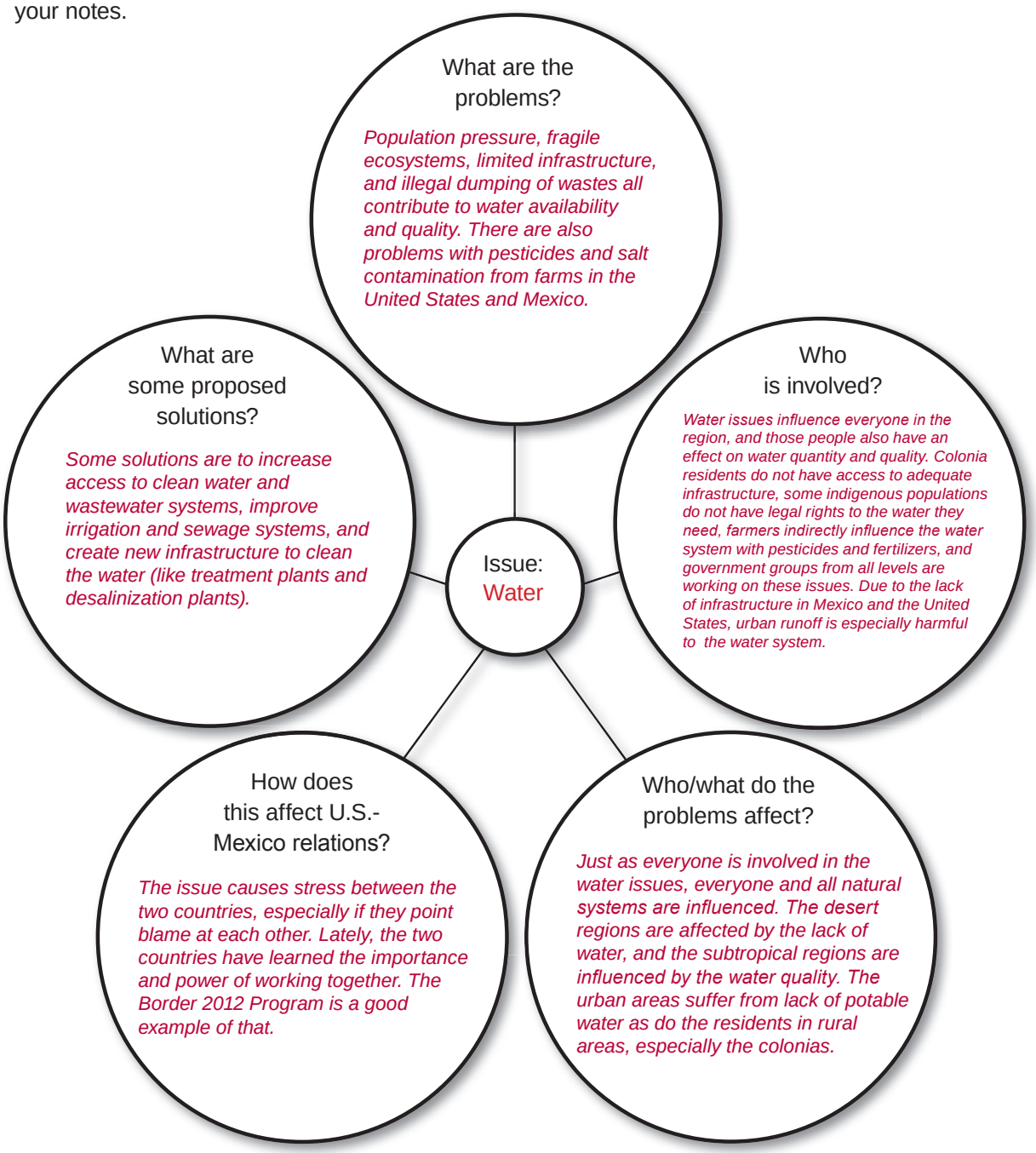
When time is up, collect **Environmental Problem Concept Map** from each student to use in assessment.

Environmental Problem Concept Map

Alternative Unit Assessment Master

Name: _____

Instructions: Using all of your notes and assignments from the unit, create a concept map for one issue—water, air, or land/soil—in the border region. Be sure to use specific examples from your notes.



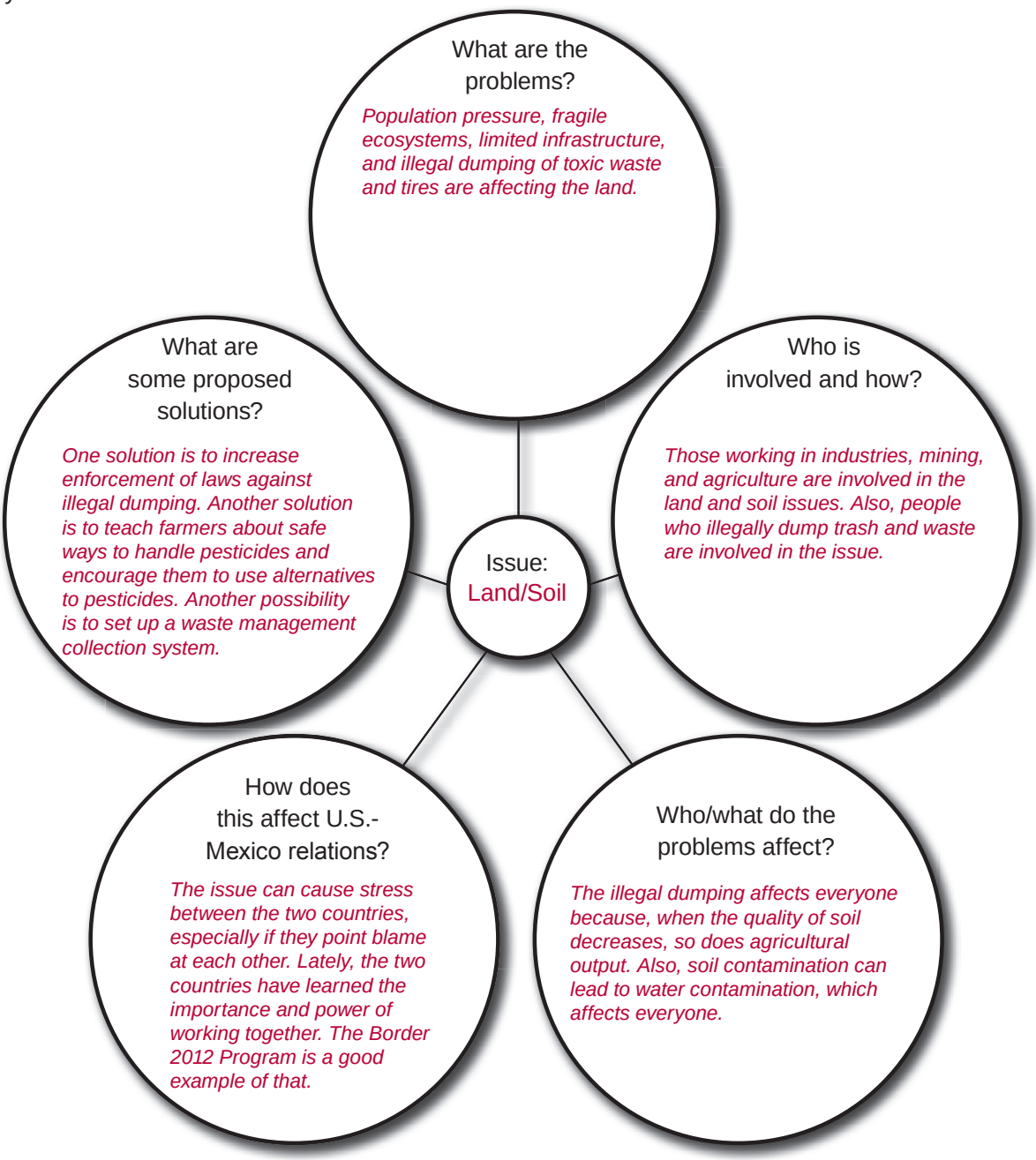
Answer Key and Sample Answers

Environmental Problem Concept Map

Alternative Unit Assessment Master

Name: _____

Instructions: Using all of your notes and assignments from the unit, create a concept map for one issue—water, air, or land/soil—in the border region. Be sure to use specific examples from your notes.

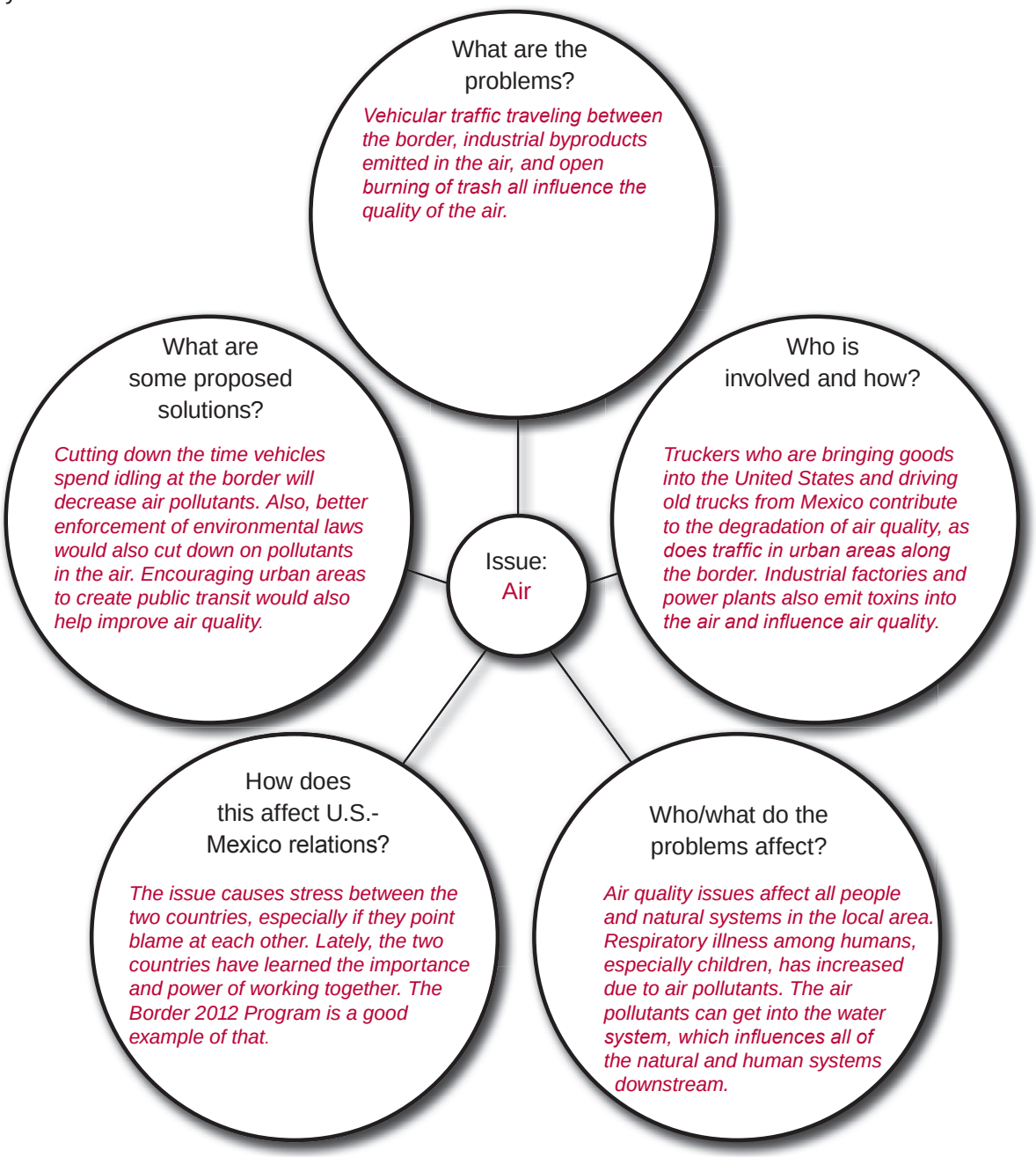


Environmental Problem Concept Map

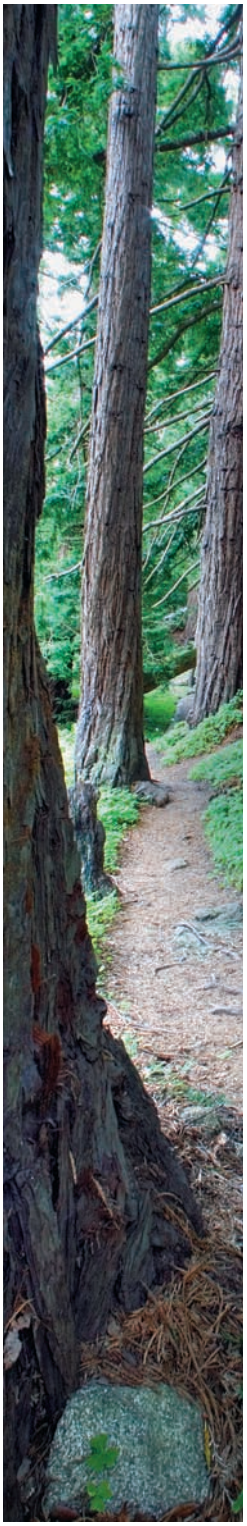
Alternative Unit Assessment Master

Name: _____

Instructions: Using all of your notes and assignments from the unit, create a concept map for one issue—water, air, or land/soil—in the border region. Be sure to use specific examples from your notes.



Extensions & Unit Resources



Extension Ideas

Have students research and debate the connection between maquiladoras and environmental issues in the U.S.-Mexico border region. One side should argue that there is limited data showing a direct connection between the maquiladoras and environmental issues in the border region. The other side should argue that there has been an apparent increase in environmental issues in areas surrounding some maquiladoras.

Encourage students to look further into the health of people who live along the border. They could research different sub-regions, identify environmental problems, and analyze the influence those problems have on people's health. Students could then present their findings to the class.

Assign students to create a PowerPoint presentation about other environmental issues in the border region. They could use pictures, music, and film clips to show the quality of life for people who live there and how environmental issues affect people's lives.

Have a local environmental expert visit class to discuss the effects specific environmental issues have on natural ecosystems.

Resources for Students

California State Parks, U.S. Fish and Wildlife Service, and National Oceanic and Atmospheric Administration. Tijuana Estuary and Border Field State Park. **http://www.tijuanaestuary.com**

Commission for Environmental Cooperation (English version). **http://www.cec.org/home/index.cfm?varian=english**

National Estuarine Research Reserve System, National Oceanic and Atmospheric Administration. Tijuana River Reserve. **http://www.nerrs.noaa.gov/TijuanaRiver**

National Park Service. Big Bend National Park. **http://www.nps.gov/bibe**

U.S. Environmental Protection Agency. U.S.-Mexico Border 2012 Program. **http://www.epa.gov/Border2012**

References for Teachers

Good Neighbor Environmental Board. February 2005. *Water Resource Management on the U.S.-Mexico Border. 8th Report to the President and the Congress of the United States.* U.S. Environmental Protection Agency. **www.epa.gov/ocem//gneb/gneb8threport/gneb8threport.pdf**

Fort, Denise. January 28, 2003. Who Owns the Rio Grande? Public v. Private Interests in a Western River. *Jurist.* **http://jurist.law.pitt.edu/forum/forumnew91.php**

International Boundary and Water Commission. **www.ibwc.state.gov**

Institute for Regional Studies of the Californias. **http://irsc.sdsu.edu**

International Relations Center. Americas Program. **http://americas.irc-online.org**

Southwest Consortium for Environmental Research and Policy. **http://www.scerp.org**

Texas Commission on Environmental Quality. Border Affairs: Environmental Issues in the U.S.-Mexico Border Region.
http://www.tceq.state.tx.us/border

Texas National Resource Conservation Commission. June 2002. *State of the Rio Grande and the Environment of the Border Region. Strategic Plan, 2003-2007.* vol. 3.
http://www.tceq.state.tx.us/assets/public/border/vol3.pdf

U. S. Census Bureau. **www.census.gov**

U. S. Department of the Interior. Bureau of Reclamation. Upper Colorado Region.
http://www.usbr.gov/uc

U.S. Environmental Protection Agency. U.S.-Mexico Border 2012 Program
http://www.epa.gov/border2012

U. S. Geological Survey. U.S-Mexico Border Environmental Health Initiative.
http://borderhealth.cr.usgs.gov

U.S.A.-Mexico Border Health. Environmental Health.
http://borderhealth.raconline.org/topics/topic.php?topic=Environmental%20health

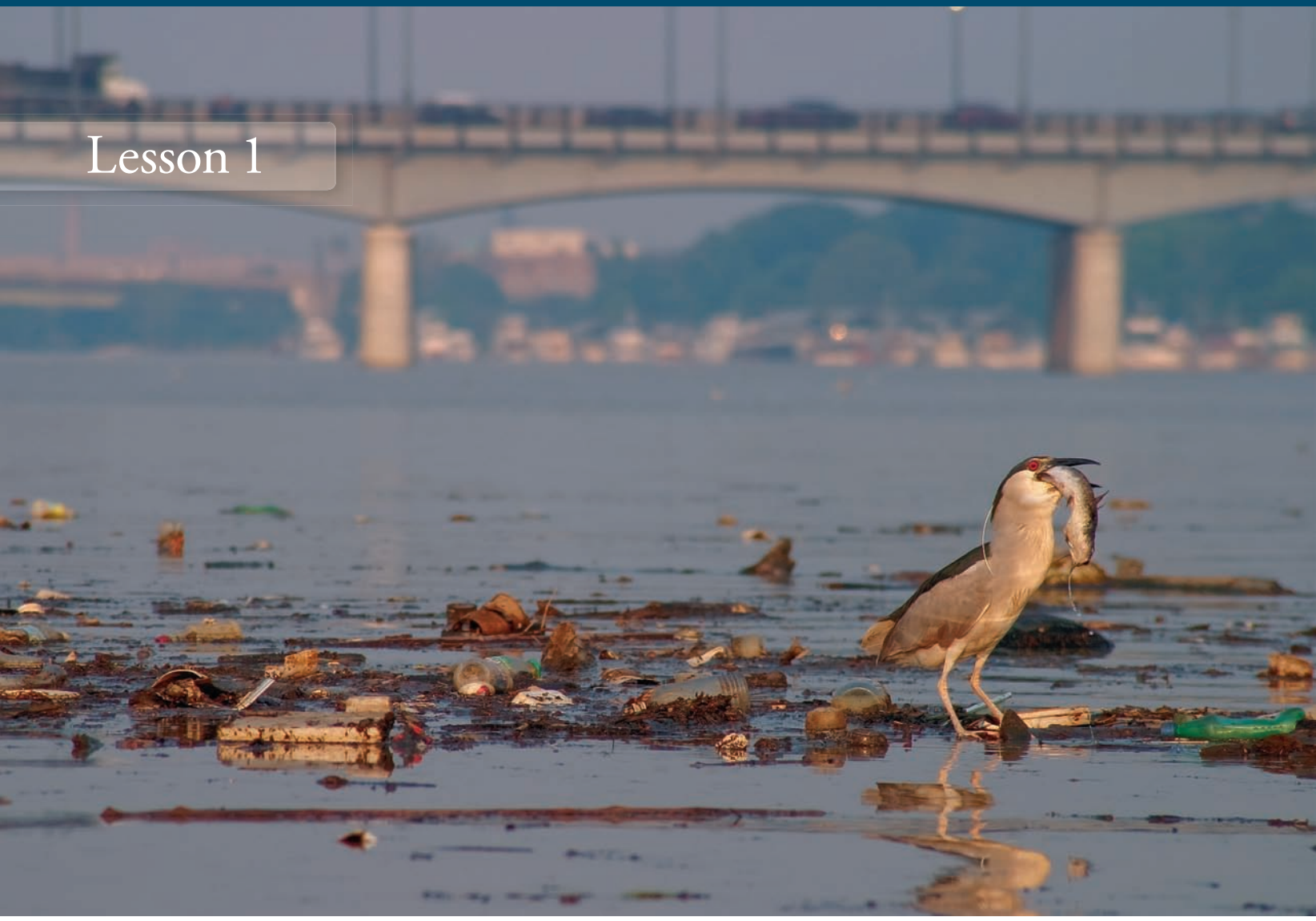
The University of Arizona Udall Center for Studies in Public Policy. U.S.-Mexico Border Environment Publications.
http://udallcenter.arizona.edu/publications/pubs_usmex.htm

Woodrow Wilson International Center for Scholars.
http.//www.wilsoncenter.org

Instructional Support

Agencies, institutions, and organizations throughout California have identified themselves as providing programs and materials that support this unit. Links to these resources are available at
http://www.calepa.ca.gov/Education/EEI/instructional_support.html

Lesson 1



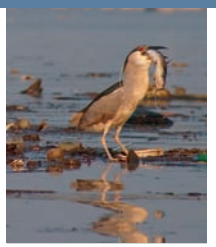
Heron eating fish in polluted river

The Tijuana River: A Shared Resource

Problems surrounding the Tijuana River make the health of the watershed a transboundary environmental issue requiring international attention. In this lesson, students brainstorm ideas about the relations between the United States and Mexico in terms of environmental issues.

The students list the environmental problems shared by the United States and Mexico that have links to economics, politics, and immigration. The students record their ideas and categorize the issues. Their work serves as the basis for a class discussion about the bigger picture regarding the relations between the United States and Mexico. It also gives the teacher insight into students' prior knowledge and opinions about these issues.

Students independently read an article about the natural and human social systems in the Tijuana River watershed. Following the reading, they organize their thoughts about and discuss the issues presented in the article. Students come to understand that the Tijuana River provides an excellent case study of the environmental issues jointly facing the United States and Mexico.



Learning Objective

Identify key environmental issues that influence the relations between the United States and Mexico.

Provide examples of environmental impacts that are not contained by the political boundaries between the United States and Mexico.

Background

The southern portion of the State of California and the entire Mexican state of Baja California lie in a coastal desert ecosystem where the human population has rapidly increased over the last 20 years, making the availability and quality of fresh water major issues. Some of the largest cities in these states—San Diego and Tijuana—occupy an increasing amount of this desert area and must import most of their water from distant sources . Although both share their names with nearby rivers, neither river serves as a source of water for either city. Instead, the cities have historically used these rivers for stormwater and wastewater management.

The quality and quantity of the water in the Tijuana and San Diego Rivers have changed as the cities have grown. Once seasonal, these rivers now run year-round with water draining from inland areas to the ocean. Where the quantity of water overall has increased in the rivers, the quality of the water has decreased over time. Urbanization and industrialization in both cities over the past decade have led directly to this decline in water quality. Water quality has directly affected the health of the riparian and coastal ecosystems in the border region of both states.

San Diego has failed to meet the federal Clean Water Act standards for more than two decades as its aging sewage system, under pressure from substantial population growth, frequently spills raw sewage into local streams and the Pacific Ocean. At the same time, an expanding population in Tijuana, faced with limited or a complete lack of waste management and sewage treatment facilities, has been dumping solid waste and sewage into the Tijuana River. The waste and sewage have affected the farmland in the river valley on both sides of the border, making the land completely unsuitable for agricultural production. The sewage in the river has made its way to the coast, contaminating both nations' beaches, estuaries, and coastal waters.

Chemical waste drums

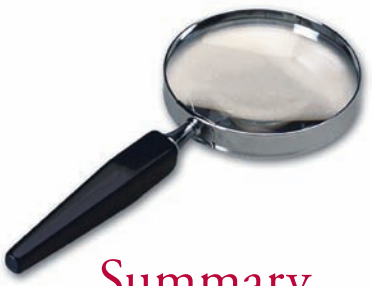
Key Vocabulary

Border region: A 62-mile (100-kilometer) wide area along the U.S.-Mexico international border, stretching 1,956 miles (3,148 kilometers) from California to the southern tip of Texas.

Infrastructure: The systems and facilities that are necessary for a human community to function. Infrastructure includes roads, sewage and water treatment plants, and power stations.

***Maquiladora*:** Mexican corporations that operate under a special program. Maquiladoras can be assembly plants, manufacturing facilities, food packing plants, or even call centers.

Toolbox



Summary of Activities

Students brainstorm problems and issues that influence relations between the United States and Mexico. They read and discuss an article about the environmental issues involving the Tijuana River watershed and consider how these issues influence life in the border region.

Instructional Support

See Extensions & Unit Resources, page 32

Prerequisite Knowledge

Students should know about:

- the general geography and location of the United States and Mexico.

Advanced Preparation

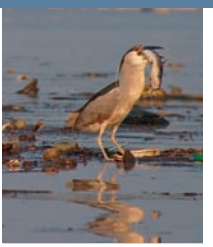
Gather and prepare Activity Masters.

Gather and prepare Materials Needed.

Gather and prepare Visual Aids.

Prepare "Problems and Issues" Chart:

- On the board, make a two-column chart with "Problems" at the top of one column and "Issues" at the top of the other. The columns should each be wide enough to fit a 3"x3" or bigger self-adhesive note.



Materials Needed

Activity supplies:
- Self-adhesive notes (3"x3" or larger): three to five per student

A-V equipment:
- Overhead or LCD projector, screen

Class supplies:
- Pencils or pens

Visual Aids

Transparencies:
- **Border Region Map**, Visual Aid #1

Duration

Preparation Time
15 min.
Instructional Time
55 min.

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

Key Unit Vocabulary
SM, Pages 8–9
One per student

California Connections: The Tijuana River–Part 1: A Shared Resource
SM, Pages 10–13
One per student

Notes on the Tijuana River
SM, Page 14
One per student

Procedures

Vocabulary Development

As appropriate, in each lesson introduce new vocabulary words using the **Key Unit Vocabulary** (Lesson 1 Activity Master).

Step 1

Ask students to explain the difference between an "issue" and a "problem." (*Answers will vary.*) Use students' input to help them understand that a "problem" is a situation that is difficult, or that causes difficulties. People can solve a problem. An "issue," in contrast, is a subject of discussion. Issues arise when people disagree about the ways to solve a problem. People can discuss and resolve issues. Ask the class to give examples of problems and issues. (*Problem—a budget deficit, issue—government spending; problem— students not graduating, issue—education; problem—water pollution, issue—water quality)*

Step 2

Give each student three self-adhesive notes. Display the **Border Region Map** (Visual Aid #1) on the overhead or LCD projector. Have students to write down three things about the region displayed on the map, writing each item on a separate self-adhesive note; students can write things they already know or things they learn by looking at the map. (*The Rio Grande River is part of the border between the United States and Mexico; immigrants cross the border from Mexico into the United States.*) Give students about 10 minutes to write three things they know about this region.

Step 3

Next, direct each student to choose one of the things written on the self-adhesive notes and decide if the item is an issue or a problem in the border region. Have students come up two at a time to place their sticky notes in one of the columns on the **Problems and Issues Chart**, depending on whether the topic is a problem or an issue.

Step 4

When each student has placed a sticky note on the chart, read off the topics posted on the chart and let the class confirm whether each is in the correct column, "Problem" or "Issue." Move topics from one column to another to correct any that are misplaced. If the same topic appears on multiple sticky notes, place those notes one on top of the other in the same column.

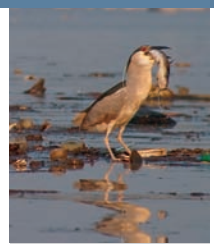
Step 5

Choose one of the following options:

If students did not list the environment as an issue in the border region and or mention pollution as a problem, ask the class if they think environmental problems affect life in the border region or if the environment is an issue that affects the relationship between the United States and Mexico. (*Yes*) If no sticky notes reflecting the environment appear under the "Issues" column, add one. Tell students that over the next several lessons, they will be learning about environmental issues that are associated with the border region and affect U.S.-Mexico relations.

If students listed the environment as an issue, point it out to students and tell them that over the next several lessons, they will be learning about the environmental issues that influence U.S.-Mexico relations.

If students did not list the environment as an issue but placed topics under the "Problem" column that suggest they were thinking about it (for example, they might have mentioned pollution, trash, smog/smoke, sewage), write "environment" on a sticky note and add it to the "Issue" column. Point out to students that problems like pollution, trash, and sewage relate to the issue of the environment. Tell them that over the next several lessons, they will be learning about the environmental issues that are associated with the border region and affect U.S.-Mexico relations.



Step 6

Distribute copies of ***California Connections: The Tijuana River—Part 1: A Shared Resource*** (Lesson 1 Activity Master) and **Notes on the Tijuana River** (Lesson 1 Activity Master) to each student.

Have students read ***California Connections: The Tijuana River—Part 1: A Shared Resource.*** As they read the story, have them complete the concept map on the **Notes on the Tijuana River** worksheet. Tell students to wait to answer the questions until after the class has discussed the article.

Step 7

When students are done reading have a class discussion using the following questions as the starting point:

- What are the main problems mentioned in the article? (*The Tijuana River is highly polluted with raw sewage, industrial waste, and garbage; this pollution influences the people and natural environment in the area. Urbanization, industrialization, and population growth cause this pollution.*)
- How are these problems connected to the environment? (*The sewage and other byproducts in the water, as well as erosion from new housing, influence the Tijuana River Estuary and change the coastal systems.*)
- How are these problems connected to the economy? (*Some reasons for the reduction in water quality have to do with the economy. The infrastructure in the area, for waste water treatment and the management of industrial wastes, is either non-existent or limited. Improving the infrastructure would cost money. The* maquiladoras *are a source of employment for Mexicans, and they also contribute to the economy in the United States. It may seem to be cheaper in the short term to dump industrial waste into the soil and water rather than create new wastewater treatment facilities.*)
- How are these problems connected to politics? (*These problems require both countries to communicate and discuss the possible solutions and economic consequences.)*

Step 8

After the class discussion, have students complete the concept maps on **Notes on the Tijuana River.**

Step 9

Ask students to name an additional issues that may not already be listed in the "Issues" column on the board (*Industrialization, infrastructure, sewage treatment, potable water*). Then ask students to name those that may be problems that should be added to the "Problems" column. (*Maquiladoras, debris, trash*) Have student volunteers place each of these on a sticky note and put it in the appropriate column on the board.

Step 10

Have students answer the guiding questions on **Notes on the Tijuana River.** When they have finished, collect the copies of ***California Connections: The Tijuana River—Part 1: A Shared Resource.*** Collect the **Notes on the Tijuana River** from each student and use in assessment.

Lesson Assessment

Description

This lesson teaches students that environmental issues influence the relationship between the United States and Mexico and gives details related to one example—the Tijuana River. Students complete a concept map to demonstrate their understanding of how the environmental issues in and around the Tijuana River relate to problems (environmental impacts) that are not contained by the countries' political boundaries. Their answers to the questions on **Notes on the Tijuana River** (Lesson 1 Activity Master) demonstrate that they can identify the health of the Tijuana River as an environmental issue that influences life in the border region and, therefore, the relations between the United States and Mexico.

Suggested Scoring

Use the Answer Key and Sample Answers on page 41 to assess student work.

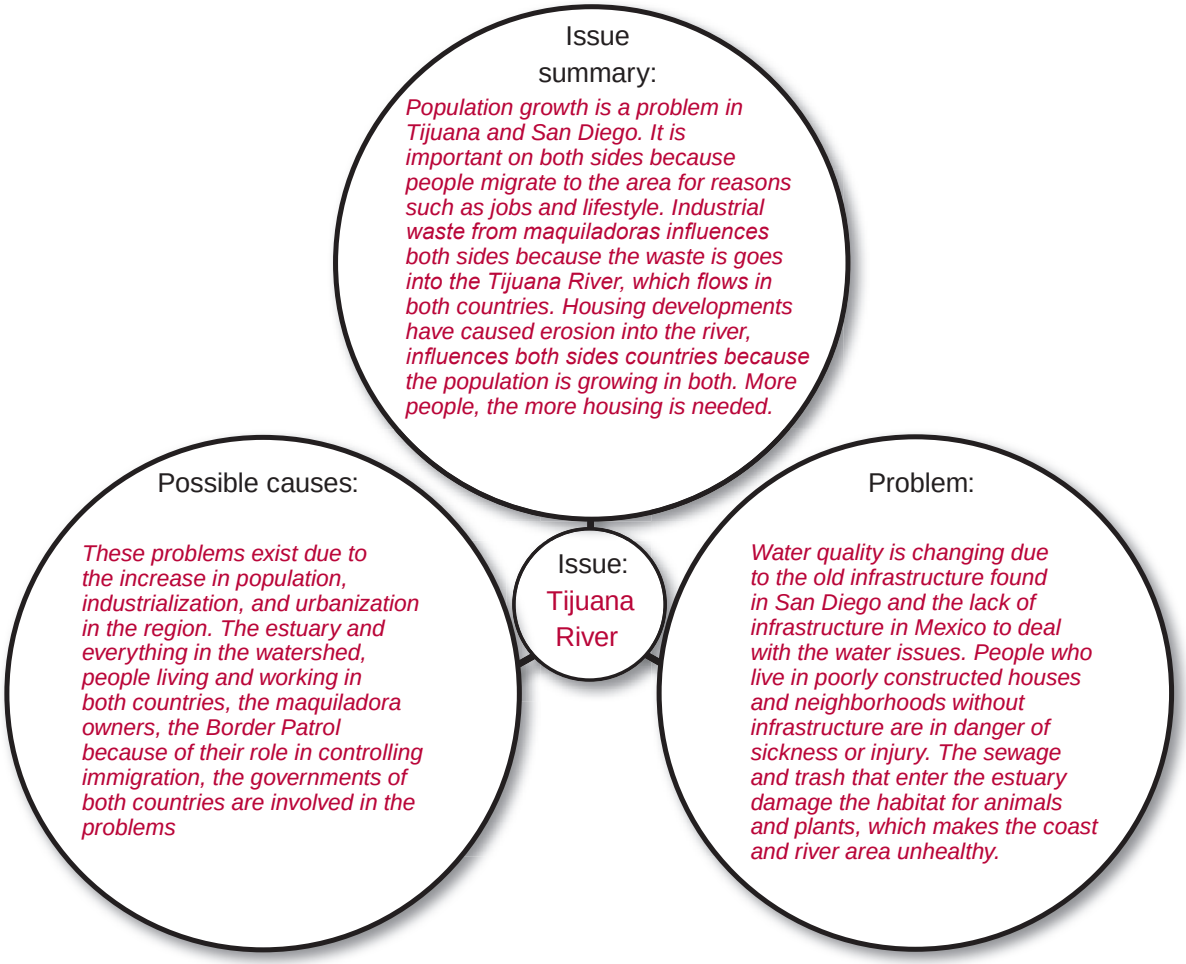
Each question on **Notes on the Tijuana River** is worth 10 points. Each completed circle is worth 20 points. The total possible score is 90 points.

Answer Key and Sample Answers

Notes on the Tijuana River

Lesson 1 Activity Master

Name: _____



Questions to Answer After Class Discussion:

1. Why are the problems in the Tijuana River watershed important to both the United States and Mexico? _____

2. Why do the problems exist? What or who is/are directly involved in the problems? _____

3. How do these problems influence life in the border region? _____

Allocation: Something, such as shared funds, that is distributed to individuals or groups according to a plan and specific purpose.

Aquifer: An underground layer of rock or sediment that holds usable amounts of groundwater.

Border region: A 62-mile (100-kilometer) wide area along the U. S.-Mexico international border, stretching 1,956 miles (3,148 kilometers) from California to the southern tip of Texas.

Convention: An agreement between nations.

Domestic: Relating to the home or everyday life in a household or in one's home country.

Emissions: The release of substances such as gases or particulates that contribute to air pollution. Other forms of emissions include noise, vibrations, light, heat, radiation, and odors.

U.S. Environmental Protection Agency: The U.S. government agency that implements federal laws designed to promote public health by protecting air, water, and soil from pollution.

Indigenous (or native): Originating in a particular region or country.

Industrialization: The changing of an area by creating industry, such as factories and power plants.

Infrastructure: The systems and facilities that are necessary for a human community to function. Infrastructure includes roads, sewage and water treatment plants, and power stations.

Lead: A heavy, highly toxic, bluish gray metallic element that bends easily and is used in car batteries, pipes, solder, and radiation shields.

Maquiladora: Mexican corporations that operate under a special program. Maquiladoras can be assembly plants, manufacturing facilities, food packing plants, or even call centers.

Median household income: A statistical value that divides household income into two segments: one half the population earning less than the median household income and the other half earning more.

Municipal: Relating to a town, city, or region that governs itself.

Outreach: Providing information or services to groups in society who otherwise might not have access to such information or services.

Particulate matter: Tiny particles of liquid and solids suspended in the atmosphere.

Population density: The measurement of population per unit area. Human population density is typically measured in units of people per square miles or kilometers.

Poverty rate: An estimated percentage of people lacking the income (money) necessary to meet their basic needs for health (food, shelter, clothing, and medical care).

Key Unit Vocabulary

Lesson 1 Activity Master | *page 2 of 2*

Restoration: The process of returning something, from a work of art to an ecosystem, to an earlier or better condition. Ecological restoration is usually targeted at ecosystems that have been degraded, transformed, or destroyed as the result of human activities.

Salinity: The total amounts of salts dissolved in water. The average salinity of sea water is 35 parts per thousand.

Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT): The Mexican government agency that encourages the protection, restoration, and preservation of ecosystems, natural resources, and environmental goods and services.

Stakeholders: Individuals, groups, or organizations that have a vested interest in a particular action or decision.

Stewardship: Careful and responsible management of land, air, water, and biodiversity to ensure healthy and fully functioning ecosystems.

Treaty: An agreement or protocol between two or more nations to create or restrict rights and responsibilities.

Watershed: The region of land that drains water into a particular watercourse or body of water.

The Tijuana River

Part 1: A Shared Resource

If you walk along the sand at Imperial Beach, along with gulls and sunbathers you are likely to see bleach bottles, plastic toys, hypodermic needles, tires, oil containers, or even a refrigerator door. You also might see a yellow sign that says *Keep Out! Sewage Contaminated Water. Exposure May Cause Illness.* The San Diego County Department of Environmental Health closed the beach at the mouth of the Tijuana River for a total of 198 days in 2006. Environmental problems cross political borders at this special place where land, river, and ocean merge with two socially and economically disparate countries.

The Tijuana River is a trans-boundary watershed, with drainages running across the border between the United States and Mexico. Most of the river flows through Mexico, where it passes the cities of Tecate and Tijuana. It enters the United States 3 miles (4.8 kilometers) before draining into the Pacific Ocean. The river meets the sea at the protected Tijuana River National Estuarine Research Reserve. This diverse ecosystem lies at the junction of terrestrial, freshwater, and marine habitats. The reserve provides refuge for several threatened and endangered species.

Surfer on contaminated b

Years ago, hiking upstream from the reserve, you might have been able to see dolphins and deer in the same day; however, those mammals are no longer found in the estuary.

Today, human activities threaten the Tijuana River watershed, which is designated as a biodiversity hotspot and a "Wetland of International Importance." The area is home to many species with limited distribution or small populations that face immediate threat.

Experts think that Tijuana's current population of 1.5 million will double by 2020. San Diego's population will increase by 1.3 million. This rapid growth means that more people will need homes, water, and places to dispose of wastes. Rapid growth is a particular problem for Mexico because it lacks infrastructure like adequate facilities for wastewater.

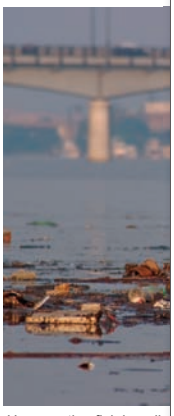
Citizens of both countries move to the border region seeking work. Migration to the region has grown since the mid-1990s, when passage of the North American Free Trade Agreement (NAFTA) allowed the United States and Mexico to trade with limited tariffs. NAFTA led to an explosion in the number of maquiladoras—assembly plants. Many of these plants are American-owned factories, operating on the Mexican side of the border. There the owners can take advantage of Mexico's lower wages and more abundant labor supply, as well as less stringent enforcement of

wastewater flowing–Los Laureles Canyon, Tijuana, Mexico

Illegal dumping and wastewater–Tijuana, Mexico

environmental regulations. Most of the profits from the maquiladoras flow back across the border to American and multinational corporations.

Money is not the only thing that flows across the border. The byproducts of manufacturing flow into the river. And, Mexico lacks the infrastructure, funds, and environmental regulation to deal effectively with the industrial waste and toxic chemicals dumped on soil and into waterways. These toxins travel downstream, polluting both surface water and groundwater, as well as the coastal waters of the Pacific Ocean. Scientists have detected high levels of heavy metals in the river. As these metals move through food chains, they acc in the tissues of anim



Heron eating fish in pollu

including humans.

The growing need for housing is another problem resulting from economic growth in the region. Many housing developments have been built on crumbling hillsides above the river. Their construction has removed the vegetation that holds the hillsides in place. When rain falls, water runs off the concrete, rather than soaking into the ground. The resulting volume and velocity of water erode the hillsides and carry the soil into the river. This sediment load pulses into the

to bury the estuary in a layer of silt.

Sediment is not the only thing flushed downriver during a storm. Because Tijuana lacks adequate sewage treatment, with each rainstorm a million gallons of raw sewage overflow downstream from Tijuana. This enormous load of organic waste poses a human health problem. The torrents also sweep trash, plastics, and even discarded appliances into the river.

Debris overwhelms the border fence. The drainage gates in Smuggler's Gulch and Goat Canyon are open all the time, allowing the current to carry debris downstream, where it pollutes the estuary, litters the beach, and flows out to sea, causing even more problems. The water and sediment that flows into Goat Canyon is caught by large sedimentation basins at the head of the canyon on the U.S. side. The problems do not stem only from Mexico. Wastewater infrastructure in San Diego is old and in disrepair. Population growth in San Diego further stresses an overburdened system.

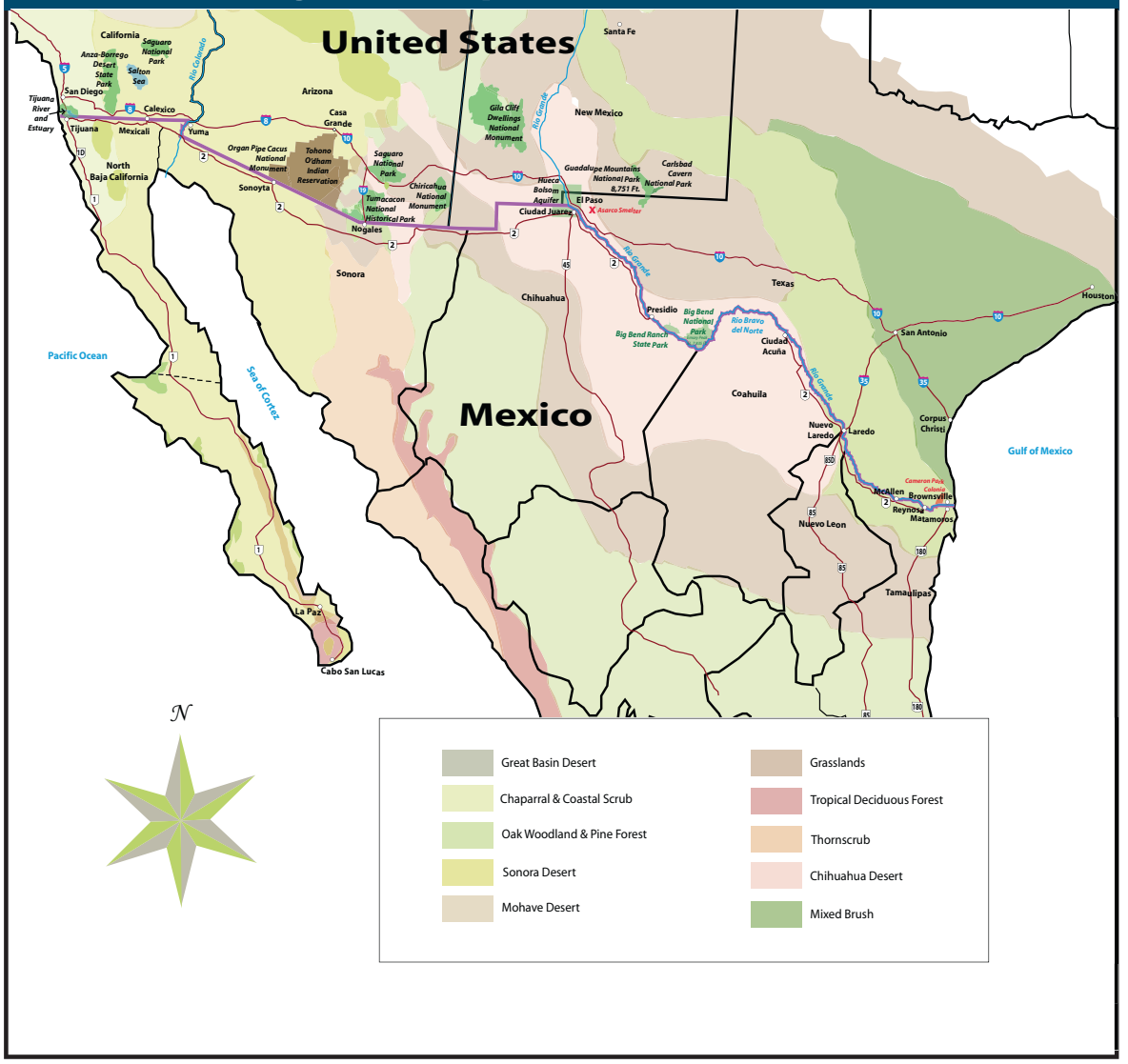
Environmental changes on one side of the border do not stay there. The river flows across the international border without regard to municipal infrastructures, and environmental and economic regulations. What enters the river upstream always flows downstream. Because of this, neither Mexico or the United States can solve these problems without working together.

Trash on beach, Imperial Beach, California

1 Border Region Map

Visual Aid — Transparency

Border Region Map




ALTO
TOURIST
AREA

Lesson 2

Area closed to protect endangered species at Tijuana estuary

Life on the Border

This lesson is focused on broadening students' understanding of the scope of environmental issues that affect U.S.-Mexico relations and examining the effects of these issues on international politics.

Students work with a partner to read and discuss various scenarios involving a variety of environmental problems found in the U.S.-Mexico border region. Using these scenario cards and a map of the region, students locate where the scenarios take place, explain the specifics of the problems involved in the scenarios, and brainstorm their possible effects on the relations between the United States and Mexico.

The students examine the real circumstances behind each of the scenarios they studied. They also review historical information on how environmental issues have influenced the relationship between the United States and Mexico. To conclude the lesson, the students assess their analyses of each scenario in light of the surrounding environmental, social, political, and economic realities.

Learning Objective

Identify key environmental issues that influence the relations between the United States and Mexico.

Provide examples of environmental impacts that are not contained by the political boundaries between the United States and Mexico.

Background

The U.S.-Mexico border region is a diverse area with climates ranging from desert to subtropical and economies supported by agriculture, industry, and tourism. The area is comprised of several major watersheds, vital to the people, economies, and natural systems throughout the region.

The border region has seen dramatic economic growth over the past 50 years. Despite the amount of money invested in the cities and industry in the border region, the region remains generally poor. Among the many reasons for this poverty is one on which most people agree: population growth in the area has outstripped the region's ability to provide necessary quantities of some basic natural resources: water, air, and soil. Population growth has also outpaced the development of infrastructure to prevent degradation of water, soil, and air quality.

Water quality and allocation top the list of environmental concerns in the border region. Agricultural runoff containing pesticides and fertilizers, toxin-laden industrial runoff, and raw sewage end up in the region's groundwater. This contamination influences the quality of freshwater supplies and the overall environmental health of the region. These same byproducts of human industry and communities also affect the soil. Mining in the border region has resulted in soil

contamination as waste products (tailings) from the extraction and processing of specific ores are not disposed of properly. Their toxic components have found their way into the water sources that support human communities as well as natural systems.

The rise in population and industry in the border region has also influenced air resources. The flow of people and products between the two countries, together with industrial emissions, continues to detract from air quality.

Local communities, indigenous groups, non-governmental organizations (NGOs), and federal agencies are starting to collaborate to address these issues, yet social, political, and economic differences and international relations make this process difficult.

Farm workers harvesting

Key Vocabulary

Aquifer: An underground layer of rock or sediment that holds usable amounts of groundwater.

Emissions: The release of substances such as gases or particulates that contribute to air pollution. Other forms of emissions include noise, vibrations, light, heat, radiation, and odors.

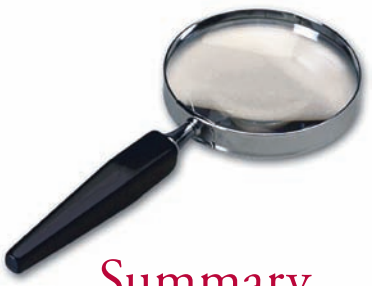
Lead: A heavy, highly toxic, bluish gray metallic element that bends easily and is used in car batteries, pipes, solder, and radiation shields.

Particulate matter: Tiny particles of liquid and solids suspended in the atmosphere.

Salinity: The total amounts of salts dissolved in water. The average salinity of sea water is 35 parts per thousand.

Watershed: The region of land that drains water into a particular watercourse or body of water.

Toolbox



Summary of Activities

Students read about environmental problems in the border region; locate on a map the areas where these problems are reported; and analyze how these problems are connected. Students discuss how environmental problems influence the relationship between the United States and Mexico.

Instructional Support

See Extensions & Unit Resources, page 32

Prerequisite Knowledge

Students should be able to:

- read and locate places on a map.

Advanced Preparation

Gather and prepare Activity Masters:

- Prepare one deck of four **Environmental Scenarios** cards for each pair of students.

Gather and prepare Materials Needed.

Write Prompt on Board:

- In a central location on the board, write, "How does one of the issues you learned about today influence the relationship between the United States and Mexico?"

Materials Needed

Class supplies:
- Pencils or pens

Visual Aids

No visual aids are required for this lesson.

Duration

Preparation Time
20 min.
Instructional Time
55 min.

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

Border Region Map
SM, Page 16
One per student

What Are the Issues?
SM, Pages 17-20
One per student

Environmental Scenarios
SM, Pages 21–22
One per pair of students

The Reality
SM, Page 23
One per student

Procedures

Vocabulary Development

As appropriate, in each lesson introduce new vocabulary words using the **Key Unit Vocabulary** (Lesson 1 Activity Master).

Step 1

Direct students to choose a partner to sit next to and work with during the lesson.

Once students are settled, distribute the **Border Region Map** (Lesson 2 Activity Master) and **What Are the Issues?** (Lesson 2 Activity Master) to each student. Give each pair a deck of **Environmental Scenarios** (Lesson 2 Activity Master).

Tell students that, during this class period, they will be reading scenarios involving environmental problems in four parts of the border region. The deck of **Environmental Scenarios** describes specific problems that have been reported in locations in both Mexico and the United States. Direct students to read each **Environmental Scenarios** card with their partner, locate the area referred to in the scenario on the **Border Region Map**, and analyze why that specific environmental problem exists. Students should record their thoughts on their individual copies of the **What Are the Issues?** handout.

Step 2

When students have completed their work analyzing the **Environmental Scenarios,** ask:

- How might these environmental problems influence the relationship between the United States and Mexico? (*Populations on both sides of the border influence and are influenced by these environmental issues; thus, in order to find effective solutions, both countries need to work together.*)
- How might these environmental problems influence the economy? (*In a region that is already relatively poor, the quality of the water, air, and soil has a major influence on the economy. If the soil is contaminated with lead and arsenic, farming will not be as productive. If clean water is not available in the colonias, then they must spend money trucking in clean water. If water's availability is limited along the Colorado River, then agricultural production will decrease.*)
- How might these environmental problems influence politics? (*Many of these environmental issues require local, state, and federal governments to work together to manage natural resources. Since many of these resources are scarce, their distribution and management can cause conflict, thereby influencing politics.*)

Step 3

Distribute **The Reality** (Lesson 2 Activity Master) to each student. Explain that this handout describes the influence that these environmental issues are having on the relations between the United States and Mexico. Read through each case study as a class.

Step 4

Collect students' copies of **The Reality, Border Region Map,** and the **Environmental Scenario** cards.

Collect the completed **What Are the Issues?** handouts for use in assessment.

Lesson Assessment

Description

This lesson helps students identify a variety of environmental problems found in the border region and the various ways these issues influence social, political, and economic factors. Students identify the environment problems and related issues for four environmental scenarios. They record their analysis on **What Are the Issues?** (Lesson 2 Activity Master), demonstrating their understanding of key environmental issues that influence the relations between the United States and Mexico. They conclude the lesson by reading about the influence of each problem on U.S.-Mexico relations.

Suggested Scoring

Use the Answer Key and Sample Answers on pages 54-57 to assess students' work.

Each question is worth two points for a total of 40 points.

What Are the Issues?

Lesson 2 Activity Master | *page 1 of 4*

Name: _____

Instructions: For each scenario card, locate the area discussed on your **Border Region Map**. Discuss the scenario with your partner. Then answer the following questions. (2 points each item)

Big Bend National Park

1. Describe the location, climate, and physical geography of Big Bend National Park.

   It is located in southwest Texas and borders the Rio Grande River and the Mexican states of Chihuahua and Coahuila. The climate is relatively dry, mild with winters and high summer and temperatures. The Chisos Mountains run through the park.

2. What is the environmental problem?

   The particulates in the air have created a haze over the national park.

3. What are the causes of the environmental problem?

   Coal-burning power plants and urbanization are the causes of this haze.

4. Who or what does the environmental problem affect?

   The particulates in the air are causing breathing problems to those who live in the area. They also influence the grasslands.

5. What is the issue in Big Bend National Park?

   Air quality

Ciudad Juarez/El Paso Border Crossing

1. Describe the location, climate, and physical geography of Ciudad Juarez and El Paso.

   El Paso, Texas, and Ciudad Juarez, Chihuahua, are in a desert region of western Texas and northern Mexico.

Answer Key and Sample Answers

What Are the Issues?

Lesson 2 Activity Master | *page 2 of 4*

Name: _____

2. What is the environmental problem?

The air quality in these cities is decreasing.

3. What are the causes of the environmental problem?

Trucks crossing the border from Mexico to the United States idle for long periods of time, causing an increase in carbon monoxide emissions.

4. Who or what (human and natural systems) does the environmental problem affect?

As this is an urban area, carbon monoxide influences the people. Breathing illnesses have increased, especially in little children who live in Ciudad Juarez and El Paso.

5. What is the issue with the Cuidad Juarez/El Paso Border Crossing?

Air quality

Asarco Smelter (copper and lead mine) near El Paso

1. Describe the location, climate, and physical geography of the location of the mine.

The lead and copper mine is located in El Paso, Texas. It is a desert area.

2. What are the environmental problems?

El Paso has the highest concentration of lead in the air of all the cities in Texas, and the soil contains high levels of lead and arsenic.

Name: _____

3. What are the causes of the environmental problems?
By-products from the mining methods emitted into the air and soil are the cause of the problems.

4. Who or what do the environmental problems affect?
The by-products influence the air and soil quality; they may also influence the water quality.

5. What is the issue with the Asarco Smelter?
Mining methods

Colorado River Basin

1. Describe the location, climate, and physical geography of the Colorado River Basin.
The Colorado River begins in Colorado and flows southwest through Utah, Arizona, Nevada, and along the border between Arizona and California. The river travels through Mexico and ends in the Gulf of California. The region is arid/semiarid and includes desert and canyon lands.

2. What are the environmental problems?
The water is over-allocated, and the quality of the water is decreasing as pesticides and salt concentrations increase.

3. What are the causes of the environmental problems?
Overuse of the water due to population growth has resulted in over-allocation; pesticide use is influencing the water quality and quantity.

Answer Key and Sample Answers

What Are the Issues?

Lesson 2 Activity Master | *page 4 of 4*

Name: _____

4. Who or what do the environmental problems affect?

The environmental problems affect the people who live along the river, the ecosystems of the Gulf of California, and agriculture.

5. What is the issue in the Colorado River Basin?

Water quality and quantity

Big Bend National Park is located in southwest Texas. It encompasses more than 800,000 acres of diverse landscapes including vast deserts and rugged mountains. A tourist to this area in the 1970s could see for hundreds of miles. Today, however, changes in air quality and a significant increase in particulates make a clear view of the area a rarity. In fact, the National Park Service believes that Big Bend National Park has the dirtiest air of all parks in the west. Studies show that the pollution sources are mostly coal-burning power plants in Texas, Mexico, and the eastern United States. Urban areas in Texas are another source. The particulates from these power plants contribute to the haze in the national park and influence the natural and human systems present. The air quality is associated with respiratory illnesses in humans. The acid compounds in the air are starting to influence the grasslands as well.

Ciudad Juarez/El Paso Border Crossing is one of the busiest checkpoints connecting the United States and Mexico. Vehicle traffic is steadily increasing due to population growth and a fast growing economy. In 2001, more than one million trucks crossed the border between Ciudad Juárez and El Paso, Texas. Air quality is decreasing. In August 2003, the Texas Commission on Environmental Quality found that vehicles idling on the international bridges produced about 22% of area-source carbon monoxide emissions in the El Paso-

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Asarco Smelter (copper and lead mine) near El Paso is owned by the American Smelting and Refinery Company (Asarco). Asarco is a Mexican mining company with headquarters in the United States. By the 1920s, Asarco had the largest mining operation in Mexico. It had several plants located along the border, including a large copper and lead mine in El Paso, Texas. In 1969, El Paso had the highest concentration of lead in the air of any city in Texas. The plant employed more than 1,000 people in the 1990s. It produced almost 1 million tons of raw materials each year. Due to low copper prices, the plant closed in 1999. In this same decade, the water and soil in the El Paso area were found to have high levels of arsenic and lead. The U.S. Environmental Protection Agency determined that decades of emissions from the mine produced the contaminated soils. Citizens of El Paso, Texas, and Ciudad Juarez, Chihuahua, fear that the mining waste will eventually end up in the Hueco Bolson Aquifer, their primary source for drinking water.

The Colorado River Basin begins in the Rocky Mountains in Colorado. It drains southwest, ending in the Gulf of California. The Colorado River is one of the most litigated and legislated rivers in the world. It supplies water to the highly populated and arid southwest. Signed in 1922, the Colorado River Compact allocated 7.5 million acre feet to the Upper Basin states (Colorado, Wyoming, New Mexico, and Utah). The compact called for the same allocation to the Lower Basin states (Arizona, Nevada, and California). A treaty signed with Mexico in 1945 stated that Mexico should also receive 1.5 million acre feet. A total of 16.5 million acre feet are allocated. Yet studies show that, on average, the Colorado River delivers only 13.5 million acre feet annually. The quantity of water is not the only problem. As the water continues south, it becomes more and more contaminated with pesticides and salt from farms in the United States. By the time the water left in the river reaches Mexican cities and the Gulf of Mexico, the salinity and pesticide levels are so high, the water damages the ecosystems in the Gulf. That water is not safe to use in agriculture. The poor water quality has affected the health of the people and the economy in the region.

The Reality

Lesson 2 Activity Master

Big Bend National Park

Because air quality was diminishing on both sides of the border, the United States and Mexico formed a Binational Air Work Group in 1990. This group's purpose is to discuss the air quality issue. They began by trying to investigate where the pollution originated. But the two countries never came to an agreement over the source. Eventually, Mexico pulled out of the group and did not participate in further research.

Ciudad Juarez/El Paso Border Crossing

Both sides of the border are cooperating to address the issue of air quality in the region. Local communities, with the support of national agencies, are working to promote alternative fuels, like biodiesel. They are also making more fuel-efficient trucks available to Mexican drivers. The national governments are working to reduce idling from trucks on the international bridges. They are managing traffic better and making border crossings more efficient. El Paso and Ciudad Juarez are also using EPA grants to train mechanics to properly repair vehicle exhaust systems.

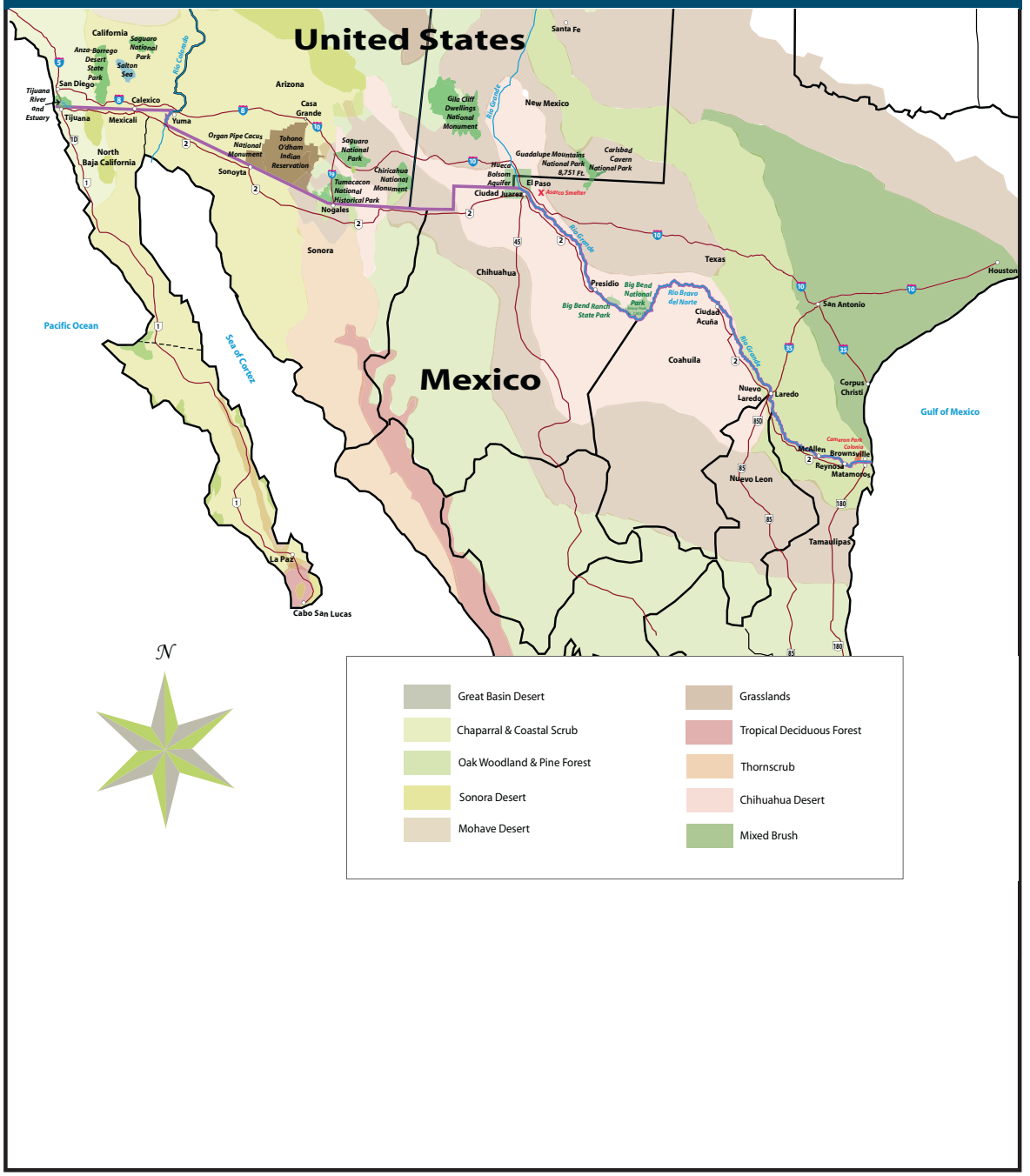
Asarco Smelting (copper and lead mine) near El Paso

In 1999, Asarco suspended operations in El Paso. The closing of the smelting plant was due to falling copper prices and because Asarco's air quality permit was not renewed. (The company applied to renew its state air quality permit with the states of Texas and New Mexico. Both states denied the company a permit.) Some cross border cooperation has occurred. The Mexican Senate's Border Affairs Commission hosted a binational forum on Asarco in 2005. At the forum, local lawmakers, non-governmental organizations, and federal agencies met to discuss Asarco. The group focused on air and soil quality issues, the mining operations, and safe cleanup of the by-products.

The Colorado River Basin

In 2005, seven states and the U.S. federal government began to renegotiate the water allocations for the states along the Colorado River. Various U.S. agencies have partnered with Colorado Basin communities to implement wetland restoration projects. Such projects help preserve natural systems along the river and improve the river's water quality. U.S. and Mexican authorities agree the two countries need to cooperate to improve water quality. They also need to increase water availability for people on both sides of the border. The two nations have begun discussing water needs and ways to protect the limited water source on both sides of the border.

Border Region Map



Lesson 3

Downtown San Diego, California

Population Pressures

Human population has increased in the border region over the past century, and the number of people living in the area has increased at an even faster rate over the past decade. In this lesson, students observe changes in the human population along the U.S.-Mexico border and consider the environmental, economic, and political implications of an increasing human population.

The students use data and maps of the border region to plot population in particular areas along the international border. They then brainstorm the effects of population growth on the natural resources available. Along with population data, the students analyze the infrastructure, income levels, and main industries found in the communities of those specific areas. Finally, students are shown population growth estimates for the border region. Working with the projections helps students understand that population pressures have an important influence on the political relationship between the United States and Mexico.

Learning Objective

Recognize the influence of growing human populations in the United States and Mexico on the relationships between the countries and their decisions about the use and management of natural systems and the goods and ecosystem services they produce.

Background

Mexico's northern border is home to more than 3 million of its 108.5 million citizens (July 2007 estimate). In 1995, one in five U.S. residents lived along the border. This number increased later in the decade, as more people moved to the "Sunbelt" to take advantage of the warm, dry weather, inexpensive housing market (in regions outside of San Diego County), and new job opportunities.

Industrialization in the border region and a stronger economy have encouraged migration to this area. As people come for the industrial jobs, opportunities in the construction, service, and entertainment industries increase, spurring even more migration. Both the United States and Mexico are keeping a careful eye on the growth and development needs of residents in the border region.

The population density in the region is already placing a severe strain on natural resources. The migrants use more land, water, and energy from the area and contribute more waste to the environment. Border cities with infrastructure built for 1990 are finding it hard to keep up with the current demand for roads, land, potable water, sewage systems, and recreational areas. Upgrading to meet the demand costs money.

The U.S. and Mexican governments allocate monies for infrastructure differently. The different income and tax structures in the two nations account for some of the difference. Wages in Mexico's border cities are much lower than in border cities on the U.S. side. The cost of living on the Mexican side is also much lower, but the cost their government pays for infrastructure is essentially the same as in the United States. Residents of Mexico's poverty-stricken *colonias* do not generally have access to potable water or sewage systems, and the lack of infrastructure increases their risk of health-related problems, putting a further strain on the country's financial resources. Experts anticipate that the population in Mexico's *colonias* will grow to 20 million by 2020, but the high level of poverty is likely to continue.

Wastewater flowing in Los Laureles Canyon

Key Vocabulary

Median household income: A statistical value that divides household income into two segments: one half the population earning less than the median household income and the other half earning more.

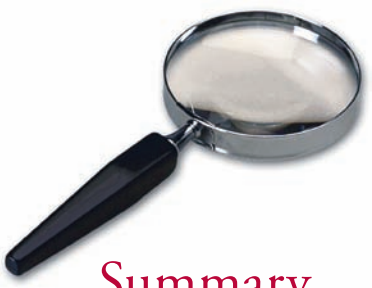
Municipal: Relating to a town, city, or region that governs itself.

Population density: The measurement of population per unit area. Human population density is typically measured in units of people per square miles or kilometers.

Tear: To shred apart.

Poverty rate: An estimated percentage of people lacking the income (money) necessary to meet their basic needs for health (food, shelter, clothing, and medical care).

Toolbox



Summary of Activities

Students add population data to a map of the border region, analyze the infrastructure and economic opportunities in specific border cities, and consider the effects of population growth on the environmental problems discussed in previous lessons.

Instructional Support

See Extensions & Unit Resources, page 32

Prerequisite Knowledge

Students should know about:

- basic population dynamics.

Students should be able to:

- read and interpret maps.
- read and interpret statistical data and percentages.

Advanced Preparation

Gather and prepare Activity Masters:

- Gather from previous lessons:
  - **Border Region Map** from Lesson 2

Gather and prepare Materials Needed.

Gather and prepare Visual Aids:

- Prepare transparencies.
- Gather from previous lessons:
  - **Border Region Map** Visual Aid #3 from Lesson 1

Materials Needed

A-V equipment:
- Overhead or LCD projector, screen

Class supplies:
- Pencils

Visual Aids

Transparencies:
- **Population Data for Six Border Cities**, Visual Aid #2
- **Population Graph**, Visual Aid #3

Duration

Preparation Time
20 min.

Instructional Time
55 min.

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

Community Statistics
SM, Page 24–25
One per student

Procedures

Vocabulary Development

As appropriate, in each lesson introduce new vocabulary words using the **Key Unit Vocabulary** (Lesson 1 Activity Master).

Step 1

Return students' individual copies of the **Border Region Map** (Lesson 2 Activity Master) and display the transparency of the **Border Region Map** (Visual Aid #1). Direct the class to locate the cities shown on the map in both the United States and Mexico. Ask students which of these cities they think has the largest population. (*Answers will vary.*) Then ask, "What might be the relationship between the population in those cities and the environmental issues we learned about in the last lesson?" (*People need resources to live. Those resources are water, land, air, food, and space. The more people there are in an area, the more resources they need; these needs raise issues. Also, how people handle the resources, like recycle waste or pollute them, may or may not cause problems.*)

Tell students that, during this lesson, they will compare population data and other community information about some border cities. Their goal is to look for patterns and relationships in the data.

Step 2

Display the **Population Data for Six Border Cities** (Visual Aid #2). Define "population density" for students: the number of persons per unit area, typically indicated as the number of people per square mile or square kilometer. Ask students, "Which city has the highest population density?" (*Tijuana has the greatest population density.*) Then ask, "Which of these cities has the largest overall population?" (*San Diego*) You may need to explain that to find the overall population of each city, students must multiply the population density by the city area.

Have the students rank the cities from 1 to 6 in terms of their overall population, with 1 being the city with the largest population and 6 being the city with the smallest population. (*#1 San Diego, #2 Tijuana, #3 Nogales, #4 El Paso, #5 Yuma, #6 Presidio*) Direct students to write those rankings on their **Border Region Map** next to the names of the cities. Ask students if they see any relationships between the populations of the cities and their locations on the map. (*Answers will vary but may include proximity to international highways, to water [rivers and the Pacific Ocean], to other points of interest such as national parks.*)

Step 3

Pair students and distribute a copy of **Community Statistics** (Lesson 3 Activity Master) to each student. Explain that this handout provides additional information about the population in the six communities. Have students first look at the data set for San Diego, California. Remind students to use their copy of the **Key Unit Vocabulary** if they need it.

Direct students to work with their partners to interpret information on their **Border Region Map,** the population data on the transparency, and the information on **Community Statistics.** They should try to identify patterns or relationships in the data. Tell students to write descriptions of at least three patterns or relationships on their copy of **Community Statistics.** Give students 10 minutes to complete this work.

Using the information for San Diego as an example, ask students if they see any pattern when they compare San Diego to the other border cities. (*San Diego has the lowest poverty rate and the greatest access to municipal water.* Other examples are provided as answers to the questions in Step 4.)

Step 4

When time is up, have each student pair share one of the patterns or relationships they identified. (Answers will vary.) Write the patterns and relationships on the board. Assist the class with identifying others:

- *The city without agriculture as a main industry has the lowest median household income (Tijuana).*
- *The city that has the highest population density has little to no agriculture as industry (Tijuana).*
- *The city with the highest poverty rate does not have manufacturing as a main industry (Presidio).*
- *The city with the lowest population seems to have the most natural land and water resources (Presidio).*
- *The cities in Mexico (Tijuana and Nogales) have fewer households with access to municipal water and sewer than the cities in the United States.*
- *In cities with the highest poverty rates, agriculture is the second main industry (Presidio and Nogales).*
- *San Diego is the only city where more people have access to municipal water than municipal sewer systems.*

Step 5

Place the **Population Graph** (Visual Aid #3) on the overhead or LCD projector. Point out the features of the graph and the general estimation of population growth in the border region.

Ask the students to speculate on the implications of population growth like that shown in the graph. Use the following discussion questions to prompt student thought:

- Where do you think the new populations will most likely settle and why? (*In the area of the border region already settled—that is, the cities. The infrastructure, job opportunities, and fact that family and friends may already be settled in these areas will be among the reasons.*)
- Taking into consideration the climate, physical geography, and population density, which city do you predict will have the most environmental problems as the population continues to grow? Why? (*Possible answer: Tijuana will have the most environmental problems because of the high population density and the fact that it does not have enough infrastructure and the median household income is so low.*)
- What makes one city better than another at dealing with environmental issues? (C*ities with the financial means to deal with environmental issues are better equipped to do so. They may plan or possibly limit housing for the people settling in the area, and prevent development that might damage the land. They are better able to build the infrastructure needed for the number of people to live in the area, thereby preventing pollution. They also have more money and resources to enforce the rules that require industries to be more responsible in their practices.*)
- How might the issue of population growth affect the relationship between Mexico and the United States? (*The population in the border region influences the environment, thus affecting the natural resources and people of both countries. To solve current problems and prevent other problems from arising in the future, the countries need to work together.*)

Step 6

Have the students complete the questions on the back of **Community Statistics**. If additional time is needed, have them complete the questions as homework.

When students have completed their work, collect the completed worksheets and **Border Region Maps** from students. Use the completed **Community Statistics** worksheets in assessment.

Lesson Assessment

Description

This lesson helps students recognize that population growth in the border region influences the natural systems and resources in the area. Student responses to the questions on **Community Statistics** (Lesson 3 Activity Master) demonstrate their understanding of the influence of population growth on natural and human social systems in the region, and on the relationship between the United States and Mexico.

Suggested Scoring

Use the Answer Key and Sample Answers provided on pages 69-70 to assess student work. Each question on **Community Statistics** is worth five points for a total of 20 points.

Answer Key and Sample Answers

Community Statistics

Lesson 3 Activity Master | *page 1 of 2*

Name: _____

San Diego, California, United States

- Access to municipal water: 99% of households
- Access to municipal municipal sewage: 98% of households
- Poverty rate is: 12.4%.
- Median household income is: $45,733.
- Main industries are: manufacturing, shipping, tourism, and agriculture.

Tijuana, Baja California, Mexico

- Access to municipal water: 80% of households
- Access to municipal municipal sewage: 85% of households
- Poverty rate is: 18.4%.
- Median household income is: $9,812.
- Main industries are: manufacturing, service, and tourism.

Yuma, Arizona, United States

- Access to municipal water: 98% of households
- Access to municipal municipal sewage: 98% of households
- Poverty rate is: 14%.
- Median household income is: $35,374.
- Main industries are: manufacturing, service, and agriculture.

Nogales, Sonora, Mexico

- Access to municipal water: 83% of households
- Access to municipal municipal sewage: 88% of households
- Poverty rate is: 33.9%.
- Median household income is: $22,306.
- Main industries are: manufacturing, agriculture, and tourism.

Presidio, Texas, United States

- Access to municipal water: 93% of households
- Access to municipal municipal sewage: 94% of households
- Poverty rate is: 43%
- Median household income is: $18,031.
- Main industries are: service and agriculture.

El Paso, Texas, United States

- Access to municipal water: 98% of households
- Access to municipal municipal sewage: 99% of households
- Poverty rate is: 20%.
- Median household income is: $32,124.
- Main industries are: manufacturing, agriculture, and service.

Patterns/ Relationships in the Data:

1. The city with the highest poverty rate does not have manufacturing as a main industry (Presidio).

2. San Diego is the only city where more people have access to municipal water than municipal sewer systems.

3. The city without agriculture as a main industry has the lowest median household income (Tijuana).

Community Statistics

Lesson 3 Activity Master | *page 2 of 2*

Name: _____

Questions to Consider: (5 points each)

1. What is the effect of population growth in areas where water, air, and land are already issues?

Growing populations require more resources. As the population grows, problems are likely to get worse, especially in areas where there are already problems related to water quantity and quality, air quality, and land resources.

2. How does the infrastructure in U.S. border cities differ from that in Mexican border cities? How might this affect the environment?

The Mexican border cities have less infrastructure than the U.S. border cities. This means that there is not enough water for the people living there and that sewage is going untreated, which will pollute the land and water supplies.

3. Why should the United States care about the infrastructure and population growth in Mexico's border cities?

The two countries share the same land, water, and air. Pollution and health problems in the area affect both countries' resources and populations.

4. Based on the information in this lesson, what two questions would you like to ask members of the U.S. or Mexican governments? Write your questions here:

Why doesn't the Mexican government allocate more money to improving the infrastructure in border communities?

How can the poverty rate in Presidio be 43% while such a high percentage of households have domestic access to water and sewer?

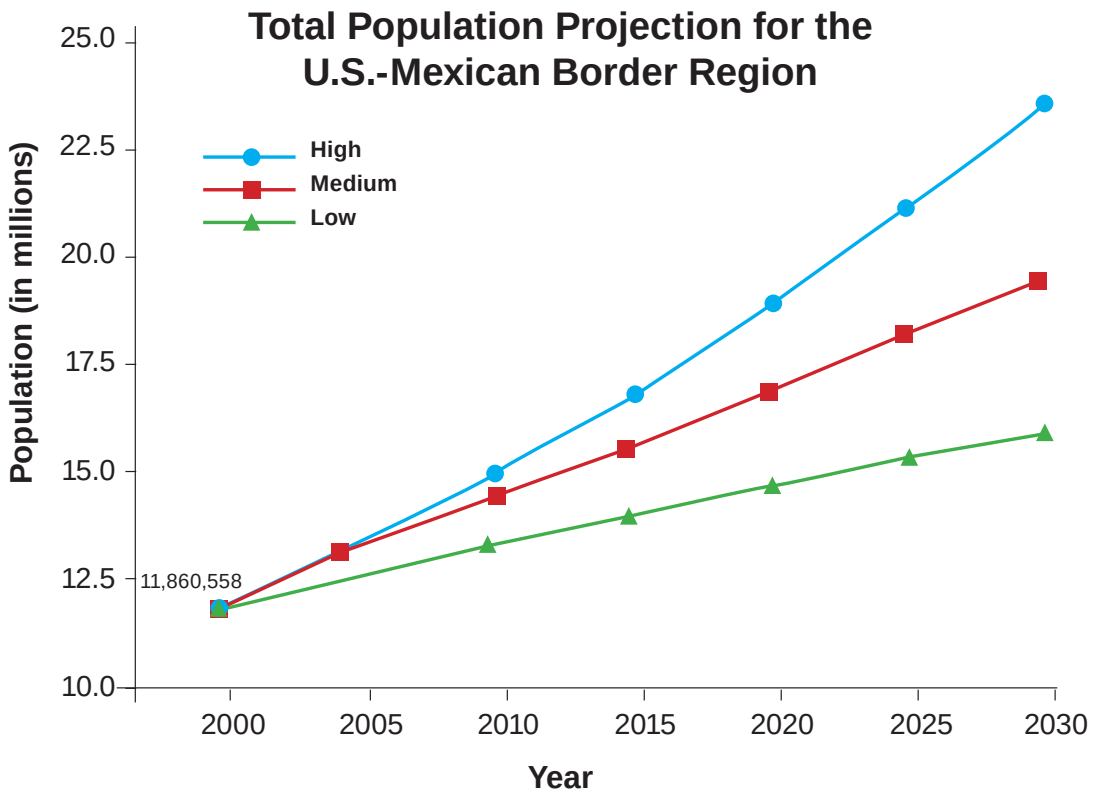
2 **Population Data for Six Border Cities**
Visual Aid — Transparency

Population Data for Six Border Cities

City	Area, square miles (square kilometers)	Population Density, people per square mile (people per square kilometer)
San Diego	372 (964)	3,871 (1,494)
Tijuana	246 (637)	5,727 (2,212)
Yuma	107 (276)	725 (281)
Nogales	647 (1,675)	1,002 (387)
Presidio	2.7 (7)	1,623 (626)
El Paso	251 (649)	2,260 (874)

3 **Population Graph**
Visual Aid — Transparency

Population Graph



J. Peach and J. Williams. 2003. "Population Dynamics of the U.S.-Mexico Border Region." Unpublished, forthcoming SCERP Monograph. San Diego: SCERP/SDSU Press.

Lesson 4

U.S.-Mexico border at Rio Grande River in Texas

From a Different Perspective

In this lesson, students take on the roles of members of various U.S. and Mexican stakeholder groups (governmental, non-governmental, indigenous, and so on) active in and around the Rio Grande River.

Each student receives information about the assigned group; they use that information to learn about the group's perspective on how best to manage the resources of the Rio Grande. During one class period, students read this background information about their groups and prepare presentations for a simulated "Conference on Environmental Partnerships between the United States and Mexico." All members of the group have a specific role to fulfill in the simulated conference, which takes place in the next class period, during which students present their groups' perspectives and learn about the perspectives of other stakeholders.

A discussion following the conference engages students in analyzing how the various stakeholders in the two nations assess environmental issues and balance them with the social, economic, and political needs of their country.

Learning Objective

Describe the difference between the two countries in terms of how each assesses and balances social, economic, political, and environmental factors in its decisions about the use and management of natural systems and the goods and ecosystem services they produce.

Background

The water from the Rio Grande (or Rio Bravo as it is called in Mexico) accounts for most of the drinking water for populations on both sides of the border. The economic growth in this area over the last 20 years has decreased the poverty in the region; however, the rate of poverty in this part of the border region is still much higher than the rest of the United States and Mexico.

The economic growth has also directly and indirectly influenced the water quality in the river. An increase in industrialization and population has led to greater risk of contamination of the water. The act of treating the water, tracking hazardous waste, and enforcing environmental laws, has been a difficult task for the local, state, and federal governments of both nations. In some areas of the Rio Grande, people are urged to avoid any contact with the water, to avoid getting sick.

Water tank at a Mexican home

In addition to affecting the quality of drinking water, population growth has affected the habitats of many aquatic and terrestrial species. In many cases, the growth has resulted in consumption of wildlife habitats for building sites.

Many stakeholders are involved in trying to address the water quality issue along the Rio Grande: the Texas Water Department Board, the Office of Rural Community Affairs, the Border Environment Cooperative Commission (BECC), residents, workers and owners of the maquiladoras, farmers, indigenous groups, and local government officials. Many have started to work together to decrease water pollution and increase the water supply.

One constraint is that monies are needed to reach these goals. Just recently, the Commission de Agua Nacional) (CAN), Mexico's National Water Commission, asked the North American Development Bank (NADB) for funds to help bolster the infrastructure related to irrigation and municipal water distribution systems throughout the river basin. CAN estimates the total cost of these improvements to be $40 million just in the area surrounding the Rio Grande. The BECC is also trying to work with the indigenous groups along the border to encourage involvement in the process. The goal is to get as many stakeholders as possible involved in the research, planning, and policy development process.

Key Vocabulary

Allocation: Something, such as shared funds, that is distributed to individuals or groups according to a plan and specific purpose.

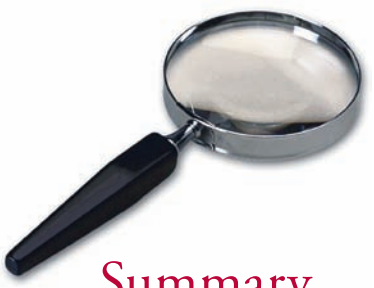
U.S. Environmental Protection Agency: The U.S. government agency that implements federal laws designed to promote public health by protecting air, water, and soil from pollution.

Indigenous (or native): Originating in a particular region or country.

Secretaria de Medio Abmiente y Recursos Naturales (SEMARNAT): The Mexican government agency that encourages the protection, restoration, and preservation of ecosystems, natural resources, and environmental goods and services.

Stakeholders: Individuals, groups, or organizations that have a vested interest in a particular action or decision.

Toolbox



Summary of Activities

Students read about the Rio Grande and work in groups to prepare for a simulated conference. They present the perspectives of various stakeholders concerned about water quality issues in the Rio Grande watershed and discuss the factors important to these stakeholders.

Instructional Support

See Extensions & Unit Resources, page 32

Prerequisite Knowledge

Students should be able to:

- write and present a brief speech on a selected topic.

Advanced Preparation

Gather and prepare Activity Masters:

- Prepare the **The Stakeholders** cards so there are enough for 8 groups

Gather and prepare Materials Needed.

Gather and prepare Visual Aids:

- Prepare transparencies.
- Gather from previous lessons:
  - **Border Region Map** transparency from Lesson 1.

Create Stakeholder Groups:

- Divide the class into eight groups and assign students to one of the stakeholder groups.

Set up Conference Area (Prior to Session 2):

- Arrange the classroom furniture to create a "conference" area.

Materials Needed

A-V equipment:

- Overhead or LCD projector, screen

Activity Supplies:

- Transparency markers: variety of colors for eight groups (Optional)
- Timer (for presentations)

Class supplies:

- Markers, paper, pencils, tape

Visual Aids

Transparencies:

- **Who Are the Stakeholders?,** Visual Aid #4
- **Conference Roles**, Visual Aids #5-6
- **Agenda for the Conference**, Visual Aid #7

Duration

Preparation Time

20 min.

Instructional Time

55-min. each,
Session 1 and Session 2

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

Background on the Rio Grande
SM, Pages 28–29
One per student

The Stakeholders
SM, Pages 30–33
One per student, equally divided among eight groups

Environmental Conference Questionnaire
SM, Page 34
One per student

Conference Notes
SM, Pages 35-36
One per student

Procedures

Vocabulary Development

As appropriate, in each lesson introduce new vocabulary words using the **Key Unit Vocabulary** (Lesson 1 Activity Master).

Session 1—Step 1

Display the transparency of the **Border Region Map** (Visual Aid #1). Ask students to look at the map and find the river that creates a natural boundary between the two nations. (*The Rio Grande*)

Tell students that the Rio Grande begins in the Rocky Mountains (Colorado) and flows south 1,885 miles (3034 km) through New Mexico and Texas before it ends in the Gulf of Mexico. For about 600 miles (966 km), the river serves as the border between the United States and Mexico. The river travels through mountains and forests, deserts, and wetlands. The river is an important resource for the people of the area as well as the diverse plant life and wildlife in the watershed.

Step 2

Distribute copies **Background on the Rio Grande** (Lesson 4 Activity Master) to each student. Read the article as a class and discuss any unfamiliar vocabulary. When the class has completed the reading, ask the following questions:

- What are the water quantity problems involving the Rio Grande? (*A severe drought in the region has affected Mexico's ability to give the United States all of the water called for by a 1944 treaty. As population grows, so does the water use, which causes problems. Another issue is the invasive species that consume large amounts of water, leaving less for the people and natural systems in the region.*)
- What are the water quality problems involving the Rio Grande? (*The rapid population growth and lack of infrastructure to treat the water are resulting in reduced water quality. Some people do not have access to clean water, and people may become sick from the water.*)

Step 3

Display **Who Are the Stakeholders?** (Visual Aid #4) to introduce the stakeholders connected to problems and issues concerning the Rio Grande. Explain that students are going to work in groups; each group will try to understand the perspectives of one stakeholder group so that they can represent that stakeholder at a conference. In their group, each student will have a particular job to do. Although they have been pre-assigned to a stakeholder group, once in their groups students can choose the job for which they are best prepared, or would like to do for the conference.

Step 4

Place **Conference Roles** (Visual Aid #5 & 6) on the overhead, and read over the various jobs that must be done in each group. Point out that students will most likely be in groups of four or five (depending on class size). If there are only four students in a group, you can eliminate the role of "Designer of Handout," or one of the students can take on two roles.

Explain that students will aid their stakeholder group in preparing for a simulated "Conference on Environmental Partnerships," which will be held during the next class period.

Put **Who Are the Stakeholders?** back on the overhead or LCD projector and have students get into their pre-assigned groups in various locations around the room, taking their copies of **Background on the Rio Grande** with them.

Step 5

Distribute copies to each stakeholder group of their section of **The Stakeholders** (Lesson 4 Activity Master) and a copy of **Environmental Conference Questionnaire** (Lesson 4 Activity Master). Instruct the groups to read and discuss the background information about their stakeholder group using **Environmental Conference Questionnaire** to guide their discussion. They should also choose the job each group member will take to prepare for and present at the conference and note that information on **Environmental Conference Questionnaire.**

Step 6

Instruct the groups to spend the rest of the class period preparing for the conference by completing their research, writing their speech, and creating their map or other visual aid for use at the conference.

Display the transparencies of the **Border Region Map** and the **Conference Roles** on the overhead or LCD projector while the groups are working.

Step 7

When the class period ends, have students take **Environmental Conference Questionnaire,** the reading about their stakeholder's perspective, and the **Background on the Rio Grande** home to help them continue to prepare for the conference. Collect **Environmental Conference Questionnaire** and the readings at the beginning of the next session and use in assessment.

Session 2—Step 1

Have students sit with their stakeholder groups in the conference area. Collect **Environmental Conference Questionnaire** from each student, along with the background readings from Lesson 4.

Step 2

Display the **Agenda for the Conference** (Visual Aid #7) on the overhead projector and distribute the **Conference Notes** (Lesson 4 Activity Master). Welcome all the groups to the conference by reading aloud the opening remarks. Point out that each group will have five minutes to present their perspective on the Rio Grande issues. Explain that while each group is presenting, the other participants at the conference should be listening and filling out the chart on the **Conference Notes** (Lesson 4 Activity Master). Suggest to students that they just make brief notes, as there is limited writing space.

Step 3

Begin the presentation with the first group on the agenda. Keep time for each group. After each group has presented, conclude the conference by asking the participants the following questions:

- Why are the environmental issues surrounding the Rio Grande so complicated? (*The environmental issues have many different causes. The growth of the economy is encouraging immigration to the area. This growth puts stress on water resources. Also, the people in the area are generally very poor, making it difficult to improve the infrastructure and availability of clean water.*)
- When stakeholders try to make decisions about the management of resources, why is it complicated? (*People have many different views on what is important. Some groups need or want the economy to flourish, yet this can influence water quality and quantity. Other groups would like to be more protective of the water and other natural resources, yet many economies are built upon the resource. If the water becomes too limited, then the economy might suffer. Another important reason is that the Rio Grande is a transboundary watershed that influences the political relationship between the United States and Mexico.)*
- How can stakeholders balance everyone's social, economic, and political concerns when dealing with environmental issues? (*All people involved in the process need to understand the various positions. They need to acknowledge and accept other viewpoints and be willing to work with each other to come to some sort of agreement.)*

Step 5

Give each group time to finish their **Conference Notes**.

Collect the speeches, maps, and other materials from each group, along with the **Conference Notes** from each student for use in assessment.

Lesson Assessment

Description

This lesson asks students to describe different ways groups in each country assess and balance social, economic, political, and environmental factors in their decisions about the use and management of natural systems. Students complete a question on **Environmental Conference Questionnaire** (Lesson 4 Activity Master) that describes the viewpoint of a particular stakeholder; they record information about other stakeholder perspectives on their copy of the **Conference Notes** (Lesson 4 Activity Master).

Suggested Scoring

Use the Answer Key and Sample Answers on pages 81–84 to assess students' work on **Environmental Conference Questionnaire** and the **Conference Notes.**

The rubric below can be used to assess and score the groups' work.

Group Presentation Rubric

Conference Material	Excellent 4 points	Good 3 points	Needs Improvement 2 points	Incomplete 1 point
Speech	Well written and presented details clearly. It adhered to the time limit.	Well written and presented. It was too short/too long.	Lacked depth of content and/or was difficult to follow. Did not adhere to time limit.	Included limited information. Speaker was unprepared.
Handout (Optional)	Contains information on all of the four requirements, clearly presented.	Contains information on three of the four requirements, clearly presented.	Contains information on two of the four requirements and/or the information is not clearly presented.	Contains information on one of the 4 requirements and/or the information is not clearly presented.
Map	Neatly and accurately shows the region and how the group is connected to the river.	Shows the region and how the group is connected to the river.	Is hard to read and does not show how the group is connected to the river.	Is hard to read and/or inaccurate.
Total Points:				

Answer Key and Sample Answers

Environmental Conference Questionnaire

Lesson 4 Activity Master

Name: _____

Instructions: After reading about and discussing your stakeholder group, answer the following questions:

1. Who is your group representing?
   Answers depend on the stakeholder group assigned

2. How is this stakeholder or group of stakeholders connected to the Rio Grande?
   Example: Kikapu (indigenous people) use the water in the river for irrigation of our farmland and the groundwater for domestic use. They have never really had access to water rights on the Rio Grande and feel left out of the process.

3. What is your role in the group?
   Refer to next page for multiple possible answers for this question

4. What do you need to do to prepare for the conference?
   Answers will depend on the role chosen and what still needs to be accomplished. Some examples would be write a speech, finish the map, create the handout, and so on.

Alternative Answers for Environmental Conference Questionnaire on previous page
Answer Key and Sample Answers

Kikapu (indigenous people): They use the water in the river for irrigation of their farmland and the groundwater for domestic use. They have never really had access to water rights on the Rio Grande and feel left out of the process.

Farmer in Northern Mexico: They use water from the Rio Grande to grow sugar cane. Their fathers and grandfathers grew cotton, and this generation tried to do the same. But the amount of water available to us is diminishing. They are struggling to keep the sugar cane crops alive during droughts, which are influencing their livelihoods.

U.S. Fish and Wildlife Service: Their job is to manage and preserve the aquatic ecosystem of the Rio Grande. The water quality and quantity are decreasing due to human activity. This is having a major effect on the endangered species of the area, as is the introduction of non-native species.

Santa Fe Environmental Group: They are very concerned about the Rio Grande Silvery Minnow, which is endangered due to lack of water in the Rio Grande. They believe people must try to change policy so that the environment is not destroyed.

City Planner in Brownsville, Texas: They see the river as a resource and need it for drinking water; however, they also would like to use the area where the river flows for development. Their population is rapidly growing, and needs more space. The Rio Grande is polluted and the water quantity is diminished. Either the ecosystem associated with the river needs to be restored, or the area needs to be used for houses.

Resident of Ciudad Juarez, Mexico: They are urban dwellers who depend on the river and the aquifers for drinking water. They now have to walk further to get water from the wells as some have been closed due to contamination. The lack of water treatment plants is causing this contamination.

Maquiladora Owners: They are connected to the Rio Grande because some other owners do not abide by the environmental laws and dispose of byproducts in the river, causing contamination. They believe the Mexican government must do more to enforce environmental laws so that people do not blame owners, like themselves, for the contaminated water.

The Border Environmental Cooperation Commission: They are concerned about the quality of the Rio Grande. Their main focus is the lack of infrastructure in Nuevo Laredo to deal with rain storms. Lack of infrastructure is causing sewage to contaminate the water. They are looking for financial help to try and rebuild the infrastructure in this area.

Name: _____

Complete the following table while you are listening to the presentations. Fill in the column for your own group as well.

Stakeholders	Where is the group located in relation to the Rio Grande?	How does the river affect the group? How does the group affect the river?	What factors influence the group's decisions about the river?	What are the group's goals for the river?
Border Environmental Cooperation Commission	*The group's headquarters is in Ciudad Juarez and El Paso. Both cities are located on the river.*	*The group affects the river by trying to protect the water and ecosystems surrounding the water. They are not directly impacted by the river.*	*The BECC is most concerned for the health of the environment and human population. All of the political, social, and economic factors must be considered when trying to improve the natural system.*	*One of the main goals is to improve the storm drain infrastructure in Nuevo Laredo. To do this, they must generate support from citizens and governmental officials and raise money.*
Santa Fe Environmental Group	*Santa Fe is located in New Mexico, which the Middle Rio Grande runs through. The Middle Rio Grande is a tributary of the Rio Grande River.*	*This group affects the river by advocating for the restoration of the natural ecosystem.*	*The main factor that influences their decision is to protect the environment. The social, political, and economic influences are not as important as preserving the environment.*	*The main goal is to save the Rio Grande silvery minnow, which is endangered. The group sued the federal government to try to get more water flowing through the river to promote a healthier habitat for the minnow.*
U.S. Fish and Wildlife Service	*The agency's regional headquarters is in Ciudad Juarez and El Paso. Both cities are located on the river.*	*The group affects the river by trying to protect the water and ecosystems surrounding the water. They are not directly impacted by the river.*	*The BECC is most concerned for the health of the environment and human population. All of the political, social, and economic factors must be considered when trying to improve the natural system.*	*One of the main goals is to improve the storm drain infrastructure in Nuevo Laredo. To do this, they must generate support from citizens and governmental officials and raise money.*
Residents of Ciudad Juarez, Mexico	*Santa Fe is located in New Mexico, which the Middle Rio Grande runs through. The Middle Rio Grande is a tributary of the Rio Grande River.*	*This group affects the river by advocating for the restoration of the natural ecosystem.*	*The main factor that influences their decision is to protect the environment. The social, political, and economic influences are not as important as preserving the environment.*	*The main goal is to save the Rio Grande silvery minnow, which is endangered. The group sued the federal government to try to get more water flowing through the river to promote a healthier habitat for the minnow.*

Conference Notes

Lesson 4 Activity Master | *page 2 of 2*

Name: _____

Complete the following table while you are listening to the presentations. Fill in the column for your own group as well.

Stakeholders	Where is the group located in relation to the Rio Grande?	How does the river affect the group? How does the group affect the river?	What factors influence the group's decisions about the river?	What are the group's goals for the river?
City Planner in Brownsville, Texas	*The city of Brownsville is located near the Rio Grande. It is built on the resacas of the river.*	*The city planners have to make sure there is enough housing and development for the people. This means using the land in the river ecosystem.*	*The financial costs of preserving the ecosystem, rather thant he environmental costs, are more than what the city would make if the resacas were drained and houses were built there.*	*To make sure that the river and its resources are put to the best use in terms of benefiting the people of the city.*
Maquilladora Owners	*This group is located on the Mexican side of the border, not necessarily right on the Rio Grande.*	*This group uses the water for industrial purposes, and some owners dump by-products of their factories directly into the river.*	*The most important influence for this group is economic. They are concerned about the costs of cleaning their by-products. At the same time, they are also contributing a lot to the local economy.*	*This group would like the Mexican government to be more responsible and enforce the environmental laws so that the public does not view all maquiladora owners as polluters.*
Farmers in Northern Mexico	*The city of Brownsville is located near the Rio Grande. It is built on the resacas of the river.*	*The city planners have to make sure there is enough housing and development for the people. This means using the land in the river ecosystem.*	*The financial costs of preserving the ecosystem, rather than the environmental costs, are more than what the city would make if the resacas were drained and houses were built there.*	*To make sure that the river and its resources are put to the best use in terms of benefiting the people of the city.*
The Kikapu	*This group is located on the Mexican side of the border, not necessarily right on the Rio Grande.*	*This group uses the water for industrial purposes, and some owners dump by-products of their factories directly into the river.*	*The most important influence for this group is economic. They are concerned about the costs of cleaning their by-products. At the same time, they are also contributing a lot to the local economy.*	*This group would like the Mexican government to be more responsible and enforce the environmental laws so that the public does not view all maquiladora owners as polluters.*

U.S.-Mexico border at Rio Grande River in Texas

Background on the Rio Grande or Rio Bravo

The Rio Grande or Rio Bravo (its name in Mexico) begins in the Rocky Mountains in Colorado. It runs south through New Mexico. Eventually, the river becomes part of the international border between the United States and Mexico. Two major concerns involving the Rio Grande are water allocation and water quality.

This river is the center of an international controversy pitting the United States against Mexico. Several factors have created a water shortage problem in some parts of the Rio Grande. This area has endured an ongoing drought since the 1990s. The drought has resulted in groundwater depletion. It has also limited the amount of water Mexico can give Texas. An international treaty in 1944 called for Mexico to "allocate" or give Texas a certain amount of Rio Grande water. Mexico currently owes the United States 1.4 million acre-feet of water under the provisions of the treaty. Due to the severity of the drought, however, Mexico has been unable to fulfill the agreement. The water availability becomes an increasing concern as the population in the region grows. Related concerns are growth of invasive aquatic weed species and river flow. Invasive species such as the water hyacinth consume large amounts of

water. Growing demand, drought, and invasive aquatic weeds have reduced the flow in the Lower Rio Grande. As a result, sandbars have formed and now prevent water from flowing to the Gulf of Mexico. The effects downstream are very detrimental, influencing the Lower Rio Grande agricultural region, the natural systems, and the communities downstream. Experts estimate the economic impacts at $400 million annually.

One major issue with the Rio Grande is water quality. The population of the region along the river is growing rapidly. The wastewater infrastructure is not adequate to keep up with the population growth. Thus, people in the region have little access to safe water. Raw sewage increases levels of bacteria. The increased bacteria levels in turn increase the risk of humans contracting diseases like hepatitis A. Agricultural runoff increases levels of nutrients in the water and decreases oxygen levels. These changes influence the natural river systems. Water quality issues are especially problematic for the poorer communities in the area, including indigenous groups, farmers, and *colonia* residents. Many have little access to potable water or adequate sewage treatment facilities.

Water tank at a Mexican home

Tractor spraying chemicals on field

The environmental issues surrounding the Rio Grande are binational. As a result, two nation's federal agencies are working together to assess and address water quality and water allocation issues that influence the region around the Rio Grande. The U.S. Environmental Protection Agency (U.S. EPA) is one of those agencies. The *Secretaria de Medio Ambiente y Recursos Naturales* (*SEMARNAT*) is the other. The two agencies have created a binational program to improve the natural and human systems in the region.

Border Environmental Cooperation Commission-(BECC) (Group 1)

As part of the North American Free Trade Agreement, Mexico and the United States created the BECC in 1993. Its purpose is to "help preserve, protect and enhance the environment of the border region in order to advance the well-being of the people of the U.S. and Mexico." To do this, the BECC assists states and local agencies in developing projects to increase infrastructure in the border region, analyze environmental projects, and evaluate the social and economic benefits of the projects. It is a binational group with headquarters in Ciudad Juarez and El Paso. The BECC has been responsible for numerous infrastructure projects—from wastewater treatment plants to sewage upgrades.

As a member of the BECC, you are very concerned about the storm sewer network in the city of Nuevo Laredo, Tamaulipas. The current system contains pipes that have deteriorated. Serious flooding occurs during rain storms. When the roads flood, the storm water runs into the sanitary sewer. Untreated sewage then flows into the Rio Grande. As a result, the people of Nuevo Laredo face increased risk of contracting water-borne diseases. The sewage continues downstream, affecting hundreds of thousands of other people and ecosystems. Your hope is to not only attain the money needed for this project, but to generate support from local people, organizations, and federal agencies. The project will require generous financial support as well as patience in completing the project.

Santa Fe Environmental Group (Group 2)

You are members of a Santa Fe environmental group that has filed a lawsuit against the U.S. government. Your group blames the government for the plight of the Rio Grande silvery minnow. The Endangered Species Act protects that fish, one of five native species of fish left in the Rio Grande. Yet it is in danger of becoming extinct—and you believe it is the government's fault.

The Rio Grande silvery minnow was once one of the most abundant species of fish in the Rio Grande watershed. Due to drought, dam construction, water extraction, and poor water quality, the minnow has disappeared from 95% of its habitat. Most of the water in the Rio Grande is allocated to municipal, industrial, and federal use. There just isn't enough water in the Rio Grande to support the silvery minnow. A Conservation Water Agreement between New Mexico and the federal government provided for 100,000 acre-feet of water to be set aside for endangered species. However, because of the severe drought over the past 10 years, the federal government had to use water that was supposed to be set aside for endangered species. The silvery minnow population has continued to decline.

Many environmentalists think of the silvery minnow as "the canary in a coal mine" for the Rio Grande. The health of the silvery minnow foretells the health of the river. Your group believes that the death of the silvery minnow in the wild means the death of the larger Rio Grande ecosystem.

U.S. Fish and Wildlife Service (Group 3)

You work for the Fish and Wildlife Service, an agency of the U.S. government. You are concerned about freshwater ecosystems in Texas. These ecosystems contribute to the natural and human systems. Freshwater in Texas is an economic source for tourism, agriculture, and urban development. It also is home to many endangered aquatic species. Of the more than 170 freshwater fish species found in Texas, more than 20 are threatened or endangered. Environmental changes like dam construction, irrigation, salinization, non-native species, and pollution all influence the fish and wildlife that inhabit the streams.

These environmental changes influence the natural systems and the freshwater aquatic species, in some cases changing the entire ecosystem. Monitoring the ecosystems and evaluating the human effect on the streams is important to you, as is understanding the relationships between human activities and natural systems. Your studies provide a guide as to what human activities influence the natural systems and what changes must occur in order to preserve natural habitats. Fish are good indicators as to the environmental health of a stream. Studies show that humans have introduced over a dozen non-native species to Texas and that at least 20% of fish species need conservation efforts, as does the aquatic environment.

Residents of Ciudad Juarez, Mexico (Group 4)

You live in Ciudad Juarez, the largest border city along the Rio Bravo. Domestic water use remains one of the major issues for the city. Agriculture uses all of the water Ciudad Juarez receives from the Rio Bravo. The residents must draw from the Hueco Bolson aquifer, a large underground reservoir, for household use. However, humans are extracting water in the aquifer at a faster rate than it is recharging. Therefore, many residents in the city must use one of the 145 wells located in the city. The city should close some of these wells because the water is polluted due to the lack of wastewater treatment facilities. The problem is especially serious in the downtown area.

One solution to the city's water issue is to clean the water in the Rio Bravo so residents could use it. Then farmers could tap into alternative water supplies like the Mesilla Bolson and Bismarck Aquifers. The main issue is how to restore and clean the water in the Rio Bravo. Some have suggested building a water treatment plant on the Mexican side of the border to clean the incoming water from upstream. However, such a plant is costly, and the Mexican federal government has not been able to dedicate enough money to build a plant. Your group would like to see the Border Environment Cooperation Commission (BECC) and the North American Development Bank (NADB) support this project. Building a treatment plant on the Rio Bravo would allow the residents of Ciudad Juarez to use the river as a source for drinking water. Residents would no longer have to walk to one of the wells, gather the water, and carry it back to their homes. It would also give the citizens of the city hope for the future: they would know that clean, potable water would be available for years to come.

City Planner in Brownsville, Texas (Group 5)

As a member of the city planners in Brownsville, Texas, you want to allow for growth in the region, but you are also concerned about biodiversity. Developers have begun and want to continue to drain the resacas to provide land for housing developments. Resacas are former channels of the Rio Grande that have been cut off from the river due to land development and construction of levees and dams. Brownsville has over 3,500 acres of resaca habitat. The water used to empty into the Rio Grande during times of flooding, but with development the water remains stagnant. There is a lot of wildlife found in these wetland areas and the water today is used for drinking water, residential use, and agriculture. The condition of the resacas has been deteriorating due to the low flow. The shallow water contains high levels of heavy metals, automotive oil, sewage, and pesticides. Recent studies of fish in the resacas have found high levels of heavy metals in the fish tissue.

Draining the resacas seems like a good idea because Brownsville needs more land for the growing population; however, the resacas still provide aquatic habitats for a variety of fish, reptiles, and birds. The pollution in the resacas is beginning to influence the wildlife and plants, and if the city continues to use the water for drinking, then the area needs to be restored. Financially, the city would benefit from having more housing, and it would be less costly than trying to preserve the ecosystems.

Maquiladora Owners (Group 6)

You are some of the many maquiladora owners in the U.S.-Mexico border region. Maquiladoras exist in many parts of Mexico, but there are more in the border region than anywhere else. Many residents view the maquiladoras in the border region as the source of the environmental problems that exist, including poor water quality and contaminants in the soil. However, every story has at least two sides.

The maquiladoras you own have brought jobs to the border region. Very few factories break any of the environmental laws set out by the U.S. and Mexican governments. The maquiladoras are obligated to return any waste produced in the factories to their country of origin for disposal. Many owners, such as you, do just this. As for those who break the law, you believe that the Mexican government needs to do its part in enforcing the environmental laws in the region. The water quality in the Rio Grande is declining, but that is not just from maquiladoras. Population growth in the area is the real issue.

The ecosystem in the area is fragile, and the increase in population in the region is influencing the natural systems. However, the maquiladoras are increasing the economy in the area, providing more money for use in solving environmental problems. The maquiladoras employ over 1 million workers, and opportunities are abundant. As maquiladora owners, you believe that the services you provide are important. Communities and local government officials are responsible for taking care of the environment.

Farmers in Northern Mexico (Group 7)

You are members of a group of sugar cane farmers who live in Northern Mexico. Your families have lived on the land you till for generations. Your fathers and grandfathers produced cotton using water from the Rio Bravo basin. You began your farming careers growing cotton too, but the past 20 years have seen the water quality and quantity decline. Because of this, you have had to switch from growing cotton to raising sugar cane. Even though sugar cane is a water-intensive crop, it does not require as much water as cotton. Years of drought have forced you to stop farming some of your land because you do not have enough water. Farming less land meant you grew less sugar cane and made less money for your family.

You could use water more efficiently. The type of irrigation system you use is not efficient, but you do not have the money to switch irrigation methods. Because irrigated agriculture accounts for a large portion of water use in the region, governments are encouraging farmers to use more efficient irrigation systems. The Mexican government would like farmers to start using more efficient systems, like the drip system, but the government does not have money allocated to help the farmers do this.

Some government officials have discussed raising the price of water. Higher prices would force farmers to change irrigation systems or start planting crops that are not as water-intensive. But this idea is challenging. Sugar cane is a perennial crop that comes back every year. To change crops now, after already investing money in sugar cane, would not be economically feasible. As it is, your family can barely get by. Changing the irrigation system or crops would not be possible unless the government provides financial and technical assistance.

The Kikapu (Group 8)

The Kikapu are a North American Indian people who originated in the the Great Lakes area. Over time, the U.S. government forced them to move south. Today, they live in Kansas and Oklahoma, as well as along the Rio Grande in northern Mexico and southern Texas. As a Kikapu, you graze cattle on the land and also cultivate wheat and other crops. Much of the land was under the ejido system, meaning that the government owned the land and your group lived on the land communally. However, in 1991, Mexico eliminated the system, citing low productivity. The government sold much of the land to corporations and some farmers. Because of the poverty rate among most indigenous groups, including yours, you can not afford to buy the land you farm. You also have little access to services like telephone, mail, and health care.

Historically, in some parts of the nation, large-scale water rights have not included American Indians. In California, however, Indian tribes have water rights. For example, the tribes have a significant influence on the management of the Klamath River. Nor do many of these groups have legal representation to help them attain rights to the water. In the 1940s, the American Smelting and Refining Company (Asarco) pumped out excessive amounts of groundwater, leaving your community unable to support yourselves. Today you must use channeled or diverted water to irrigate your crops. In the desert environment where you live, droughts and issues with water quantity and quality greatly affect your community. The by-products from power plants located in Coahuila, Mexico, and Eagle Pass, Texas, directly affect the air, water, and soil where you live. Many members of your community have complained of sickness and eye irritation from the quality of water in the Rio Grande.

4 **Who Are the Stakeholders?**
Visual Aid — Transparency

Who Are the Stakeholders?

- Border Environmental Cooperation Commission (BECC)
- Santa Fe Environmental Group (flag of Santa Fe)
- U.S. Fish and Wildlife Service (official symbol)
- Residents of Ciudad Juarez, Mexico (official city seal)
- City Planner in Brownsville, Texas (official city seal)
- MO — Maquiladora Owners
- FNM — Farmers in Northern Mexico
- kikapu — The Kikapu

5 **Conference Roles**
Visual Aid — Transparency

Conference Roles

Speech Writer
Responsibilities: Writing a three-four minute speech about your stakeholder group. You must include:

- background on your group (who you are, where you are located)
- how you influence or are influenced by the Rio Grande/Rio Bravo
- what factors affect your decisions about the river
- your goals involving the river

Speaker
Responsibilities: Presenting the three-four minute speech at the "Conference on Environmental Partnerships." Because you are presenting the speech, you should practice reading the speech before the conference. You may also be involved in writing the speech. You should also be familiar with the map you will show the audience during your presentation at the conference. That map is being made or found by your Cartographer.

Cartographer
Responsibilities: Creating or finding a map that shows where your group is located and how it is connected to the Rio Grande/Rio Bravo. (If your group is the Border Environmental Cooperation Commission (BECC) or U.S. Fish and Wildlife Service, you should prepare a general map of the region that shows the main cities and communities as well as where the river flows.)

6 **Conference Roles**
Visual Aid — Transparency

Conference Roles

Researcher/Editor
Responsibilities: Making sure the content presented in the handout and speech is accurate, the content on the map is accurate, and vocabulary is used correctly. While the other members of the group are writing and preparing maps, you should help provide content to be included in the speech, map, and any handouts your group chooses to give out.

Designer of Handout (Optional)
Responsibilities: Creating a handout to share with the other conference members. The handout should include some background on your group, how you are connected to the Rio Grande/Rio Bravo, your goals, and how you suggest attaining those goals.

7 **Agenda for the Conference**
Visual Aid — Transparency

Agenda for the Conference

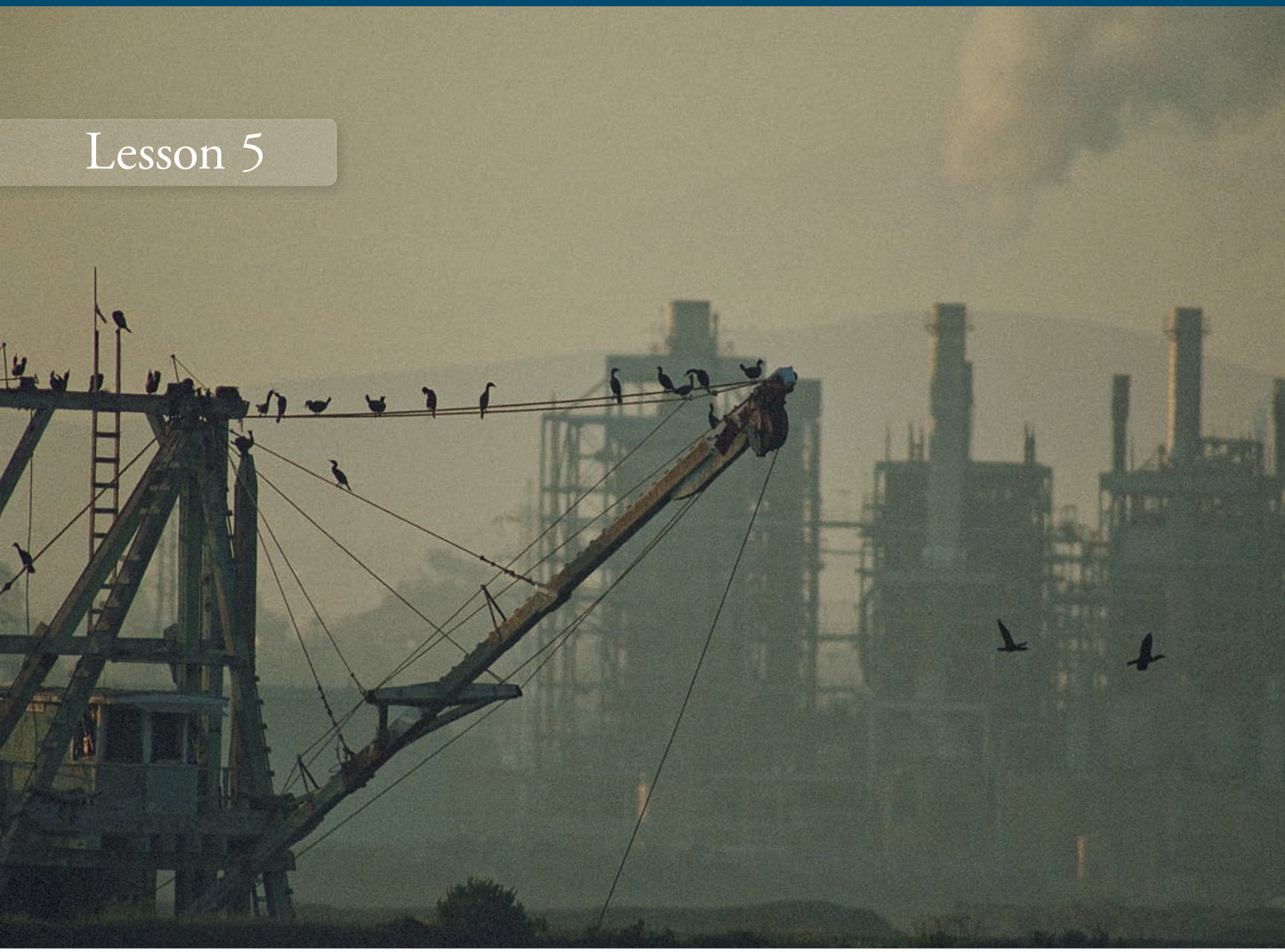
Welcome to the first annual **Conference on Environmental Partnerships between the United States and Mexico.** We have come together today to learn about the people and organizations that care about and are influenced by the Rio Grande/Rio Bravo. As the population continues to increase in the border region, concern grows regarding the quality of water and having enough water available for people and businesses on both sides of the border.

We will begin by having each stakeholder group present their perspective. Each group has five minutes to present. The groups will present in the following order:

1. Border Environmental Cooperation Commission (BECC)
2. Santa Fe Environmental Group
3. U.S. Fish and Wildlife Service
4. Residents of Ciudad Juarez, Mexico
5. City Planner in Brownsville, Texas
6. Maquiladora Owners
7. Farmers in Northern Mexico
8. The Kikapu

During the presentations, take notes, using the Conference Notes form (Lesson 4 Activity Master), on how the other groups are connected to the Rio Grande. Once all groups have presented, we will discuss some questions as a group.

Lesson 5



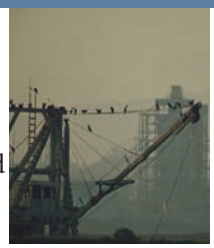
Industrial smokestacks near San Diego National Wildlife Refuge–San Diego, California

International Agreements

Students previously learned about some of the environmental issues present in the border region, the rapid population growth and its potential influence on the natural systems with resources already at issue, and the perspectives of different stakeholders in the issues in the region.

In this lesson, they examine three international efforts—The La Paz Agreement, the environmental provisions in NAFTA, and the Border 2012 Program, All are agreements between the United States and Mexico created to help resolve environmental issues affecting both countries.

After analyzing the purposes and goals of each of these efforts, students conclude the lesson by writing an essay in which they explain why environmental issues at the border require the cooperation and effort of both countries. In the end, students see that both countries have made strides in implementing environmental laws and forming coalitions to assess and monitor quality of life in the border region, with the goal of preventing additional environmental problems as the population grows.



Learning Objective

Identify treaties and conventions that regulate environmental issues shared by both the United States and Mexico.

Background

The complex issues in the border region have prompted local, state, federal, and tribal governments to establish partnerships with the goal of creating programs and agreements to improve environmental conditions in the region. The first major agreement between the United States and Mexico was the La Paz Agreement. The North American Free Trade Agreement (NAFTA), which went into effect in 1994, included environmental provisions. Both of these agreements paved the way for the largest and most comprehensive program, the Border 2012 Program. This endeavor is a collaboration between the federal governments of Mexico and the United States, state and local governments, community members, indigenous groups, and non-governmental organizations. The goal of the program is "to protect the environment and public health in the U.S.-Mexico border region, consistent with the principles of sustainable development."

The 1983 La Paz Agreement was the first environmental agreement signed by the United States and Mexico. At that time, the two countries also established the Border Environmental Cooperative Commission (BECC) and the North American Development Bank (NADB). These organizations work to help finance local communities that are trying to implement environmental infrastructure projects. Local, regional, and national leaders on both sides of the border felt the La Paz Agreement and NAFTA created an atmosphere for dialogue about environmental issues, yet neither encouraged much action. The Border 2012 Program's goals are synonymous with the goals of the La Paz Agreement—to reduce water, air, and land contamination, improve environmental health, establish emergency preparedness and response, and promote environmental stewardship. One of the reasons for the Border 2012 Program's success is that it brings together many different people and groups from the local, regional, and national levels.

The signing of NAFTA in 1993 made it one of the first international trade agreements to include a section on environmental issues. The United States and Mexico agreed to work cooperatively to address the environmental problems along the border including growth of population and industry in the border region.

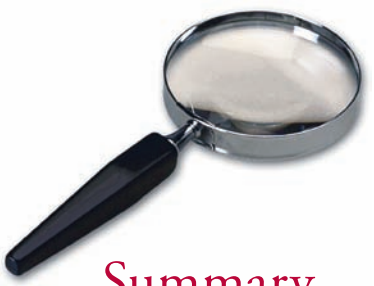
Oil tank washed up on beach

Key Vocabulary

Convention: An agreement between nations.

Treaty: An agreement or protocol between two or more nations to create or restrict rights and responsibilities.

Toolbox



Summary of Activities

Using a jigsaw approach, students learn about an international agreement, the environmental provisions in an international trade agreement, and a binational program designed to regulate environmental issues in the border region.

Instructional Support

See Extensions & Unit Resources, page 32

Prerequisite Knowledge

Students should have:

- completed previous lessons.

Advanced Preparation

Gather and prepare Activity Masters.

Gather and prepare Materials Needed.

Materials Needed

Class supplies:
- pencils

Visual Aids

No Visual Aids are required for this lesson.

Duration

Preparation Time
15 min.
Instructional Time
55 min.

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

The La Paz Agreement
SM, Page 41
One per student
(one-third of class)

NAFTA's Environmental Provisions
SM, Page 42
One per student
(one-third of class)

Border 2012 Program
SM, Page 43
One per student
(one-third of class)

International Agreement
SM, Pages 44–45
One per student

Procedures

Vocabulary Development

As appropriate, in each lesson introduce new vocabulary words using the **Key Unit Vocabulary** (Lesson 1 Activity Master).

Step 1

Ask students to think about the different ways that the United States and Mexico could resolve the environmental issues in the border region. Have students share some of their thoughts; write their responses on the board. *(The two nations could agree to change the allocation of the Colorado River water, sign treaties to give Mexico more economic aid in exchange for regulating byproducts from* maquiladoras*, support grassroots community efforts to clean up waste, provide grants to improve infrastructure in the region, and many other ways.)*

Step 2

Point out that many of students' ideas call for the United States and Mexico to enter into some kind of agreement. Agreements among nations are called conventions or treaties. Explain that the two countries already have many such agreements and several programs designed to deal with environmental issues in the border region. Mention that they will be learning about three of those agreements and associated programs during this lesson.

Step 3

Organize the students into three "expert" groups, explaining that each group will focus on one agreement or program. Distribute **The La Paz Agreement** (Lesson 5 Activity Master) to each student in one group, **NAFTA's Environmental Provisions** (Lesson 5 Activity Master) to each student in the second group, and **Border 2012 Program** (Lesson 5 Activity Master) to each student in the third group. Give all students copie of **International Agreements** (Lesson 5 Activity Master).

Have each expert group read about its agreement or program, filling out the section of **International Agreements** that applies to their reading. Encourage students to talk within their groups to ensure that all group members have answered the questions correctly and understand the information well enough to teach it to others.

Step 4

When the expert groups are done reading, discussing the information, and completing the appropriate section of **International Agreements**, direct students to form new groups of three. Each group of three should include one student from each of the expert groups. Each member of the new groups should use the structure of **International Agreements** to describe their agreement or program to the other students in the group. All students should use the information from their classmates to complete the rest of the chart on **International Agreements.**

Step 5

When students have completed their work on **International Agreements,** ask the class, "What kinds of issues cross international borders and require international agreements?" (*Accept students' opinions and thoughts.*)

Direct students to respond to the prompt at the bottom of **International Agreements**. Their responses should take the form of brief essays. They may take the rest of the class period to complete the essay or, if necessary, assign it as homework.

Step 6

When students have completed their essays, collect their copies of the readings and **International Agreements** to use in assessment.

Lesson Assessment

Description

This lesson helps students identify international agreements between the United States and Mexico that regulate their shared environmental issues; students learn about a binational program (Border 2012), the environmental provisions in an international trade agreement (NAFTA), and an agreement (La Paz). Students identify details of the two agreements and the Border 2012 Program that relate to regulating the environmental issues on **International Agreements** (Lesson 5 Activity Master). They also write a brief essay responding to a question about why environmental issues influence international politics.

Suggested Scoring

This is an ungraded activity.

International Agreement

Lesson 5 Activity Master | *page 1 of 2*

Name: _____

Instructions:

1. In your expert group, read the background on your agreement or program. Use that information to fill in the appropriate column. Discuss the information with members of your group to be sure you understand the agreement and can teach your classmates about it.

2. You will join a group of three with members of the other two expert groups. In your new group, teach the other students about your international agreement or program using the chart on page 2 to organize your presentation.

3. When the other two members of your group teach about their agreements or program, fill in the information they give you in the appropriate columns.

How and why do environmental issues influence international politics?

Many different kinds of environmental issues transcend international borders. For example, vehicle exhaust from urban areas goes into the air. Political boundaries do not contain this air basin, and pollutants can affect areas on both sides of the border.

The pollutants in the air can influence the health of the communities, which can in turn take its toll on the health care industry.

Another example of an environmental issue that crosses international borders is sewage deposited in a watershed in urban areas. That sewage can impact the people and natural systems on the other side of the border. The effects of the sewage on the ecosystems could discourage people from traveling to the area. This could hurt the tourist industry and the economy of the whole area.

Another serious issue found in the border region involves pesticides from agricultural areas which filter into the groundwater. The chemicals can then end up in aquifers that extend beyond the international boundary. This change in water quality can damage the ecosystems, which influence the livelihoods of the people who use the natural systems for economic purposes. All of these examples show how environmental issues can cross boundaries and influence economies and politics.

Answer Key and Sample Answers

International Agreement

Lesson 5 Activity Master | *page 2 of 2*

Name: _____

Getting the Details of:	The La Paz Agreement	NAFTA's Environmental Provisions	Border 2012 Program
What is the background of the agreement/ program? (When was it signed? What came before it? Why was it created?)	*It was signed in 1983. It was the first environmental agreement signed to work cooperatively on environmental problems. It was created to address the emerging environmental problems facing the border region.*	*These environmental provisions followed the La Paz Agreement and were signed at the same time as NAFTA (1993). They were created to address the environmental problems that would come from free trade.*	*This program came after the La Paz Agreement and NAFTA. It was created to ensure sustainable development in the border region using a bottom-up approach. Also, it was intended to implement the ideas in the La Paz Agreement.*
What are the main goals of the agreement or program?	*To protect and improve the environment in the border region.*	*To ensure enforcement of domestic laws and provide financing for environmental projects.*	*To protect the environment and public health of the border region.*
What, if any, are the drawbacks of the agreement/ program?	*The agreement has not been fully implemented. Process is uneven. No emphasis was put on enforcingenvironmental laws.*	*The provisions are not funded well, and Mexico is supposed to give as much as money to environmental programs as the United States. Some are concerned about having environmental provisions in a trade agreement.*	*No drawbacks were stated in the reading.*

The La Paz Agreement

The United States and Mexico first began to work together to address environmental problems in 1983. That year, the presidents of both countries signed the La Paz Agreement. The main goal of the La Paz Agreement was to protect and improve the environment of the border region. The agreement had three important parts.

The first part defined the border region as the area 62 miles (100 kilometers) north and south of the actual border. The two nations still use this definition of the border region today.

A second part of the agreement formed several working groups. Each working group specializes in a specific environmental issue: water, air, land, pollution prevention, and enforcement of environmental laws. Experts from both sides of the border serve on each of the working groups.

A third part of the agreement identified problems of immediate concern to both nations. These problems are sewage and waste in the Tijuana River, poor infrastructure in the border cities, illegal movement of hazardous waste from the United States into Mexico, and air pollution in the urban areas and at the border crossings.

Since the two nations signed the La Paz Agreement, progress has occurred, especially in addressing air quality problems. The La Paz Agreement opened up the dialogue between the United States and Mexico and created a structure for cooperation. However, in the decades following the agreement, environmental conditions along the border continued to deteriorate. Some critics complain that progress is too slow. The La Paz Agreement does not specifically require enforcing the two nation's domestic environmental laws. Questions about the effectiveness of the agreement remain.

Trash and erosion–Los Laureles Canyon, Tijuana

Even with the concerns about the effectiveness of the agreement, the United States and Mexico continue to use this agreement. It has paved the way for other agreements. Several programs, including the Border 2012 Program (which another group is examining), were created to support the La Paz Agreement and resolve the issues it identified in 1983.

NAFTA's Environmental Provisions

Canada, the United States, and Mexico signed the North American Free Trade Agreement (NAFTA) in 1993. This agreement had the goal of increasing trade through lowering tariffs and other federal laws that served to regulate commerce between the countries. At the time, many people were concerned about how the lowering of these trade barriers would affect the environment. What would happen if one country had weaker environmental laws than the others? Many companies would race to open factories in that country to avoid the cost of proper waste disposal or of meeting emissions standards. The other concern was that more trade would increase population and industrial growth in the region. This growth would affect the ecosystems of the border region. Because of these concerns, the United States and Mexico felt it was important to include environmental provisions in the trade agreement.

The leaders of Canada, the United States, and Mexico signed the North American Agreement on Environmental Cooperation (NAAEC) along with NAFTA. This agreement created the Commission for Environmental Cooperation (CEC). The CEC's goal is to improve environmental cooperation among the countries by providing a process for airing public concerns and settling disputes. The CEC also has the power to fine countries if they fail to enforce their own environmental laws.

The NAAEC recognized that, in order to protect and improve the environment of the border region, environmental projects needed monetary support. Therefore, the agreement called for creation of two additional groups: The Border Environmental Cooperation Commission (BECC) and the North American Development Bank (NADB). The BECC helps communities in the border region design projects that will help improve and protect the environment. The NADB helps the community determine the costs of their projects. Once the cost is determined, NADB decides whether or not to give money to the community to begin the project.

People have several concerns regarding the NAAEC. First, NADB relies on the United States and Mexico to contribute equal amounts of money to support the projects that the communities create. Many wonder if it is fair to ask all the countries to contribute the same amount of money. A second concern is that NAFTA is a trade agreement, not an environmental agreement. Some believe that environmental issues will not get enough attention as part of a trade agreement, where improving the economy, not the environment, is the goal.

Maquiladora or assembly plant

Border 2012 Program

The Border 2012 Program began in 2002. Its overall goal is to help carry out the efforts Mexico and the United States are making under the La Paz Agreement of 1983. It is active in the 14 "sister-cities" along the U.S.-Mexico border. Overall, the Border 2012 Program has six specific goals:

- Goal 1: Reduce Water Contamination
- Goal 2: Reduce Air Pollution
- Goal 3: Reduce Land Contamination
- Goal 4: Improve Environmental Health
- Goal 5: Establish Emergency Preparedness and Response Protocols
- Goal 6: Promote Environmental Stewardship

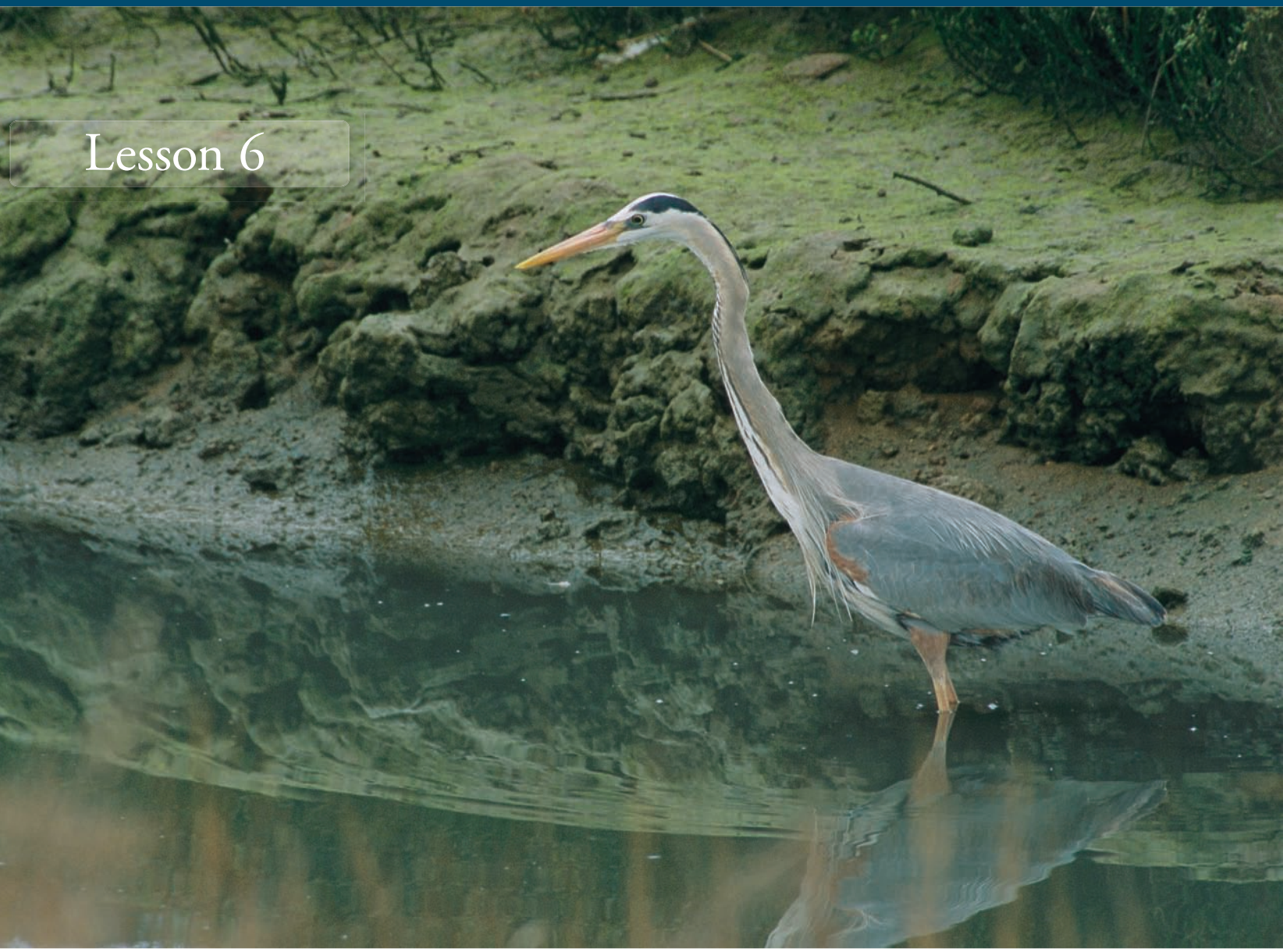
The Border 2012 Program is currently working on six projects. The first is providing adequate and clean water to the human and natural systems in the region. The second is improving the air quality in the region by decreasing the emissions from cars, industry, and urban sources. The third is decreasing land contamination resulting from the improper disposal of solid and hazardous waste. The fourth task is improving the health of the people who inhabit the region. The fifth task is developing an emergency response plan in the event of a natural or human–caused disaster in the region. The sixth task is increasing the environmental responsibility of local industries, especially the maquiladoras. The plan is to solve these problems and documented improvements by the year 2012.

The approach of the Border 2012 Program differs from that provided for in most treaties and agreements. The traditional approach involves decisions made by government officials, far away from the affected region. In the Border 2012 Program, local people and communities give their input and make decisions. People from the ten border states as well as the Indian nations living in the border region can actively participate in decisions about their environment.

Oil tank washed up on beach

The Border 2012 Program has been very successful in looking at the environmental problems, planning for changes, and implementing the changes. All interested parties in the border region continue to support the program.

Lesson 6

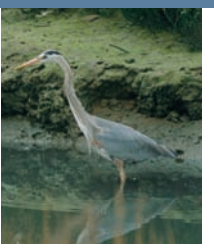


Great blue heron hunting

The Future of the Tijuana River

Previous lessons examined the international efforts made to improve the environmental health of the border region. This final lesson places the relationship between the United States and Mexico back into a California context.

The students revisit the ***California Connections: The Tijuana River—Part 1: A Shared Resource*** and read ***California Connections: The Tijuana River—Part 2: Working Together to Find Solutions***, which discusses recent actions by community and governmental organizations working to resolve environmental issues in the Tijuana River watershed. Students learn that the environmental issues that surround the Tijuana River continue to influence the relationship between the United States and Mexico. This lesson also provides an opportunity for students to reflect on the viewpoints of the various stakeholders, the effect of population growth on the border region, and other agreements and programs currently addressing environmental issues in other parts of the border region.



Learning Objective

Identify key environmental issues that influence the relations between the United States and Mexico.

Provide examples of environmental impacts that are not contained by the political boundaries between the United States and Mexico.

Background

International support for dealing with environmental issues involving the Tijuana River watershed continues to grow. The Tijuana River National Estuarine Research Reserve (TRNERR) in Imperial Beach, California, is researching the issues and developing plans to improve the health of ecosystems in the region. The reserve uses innovative education and outreach programs to increase awareness of environmental issues involving the Tijuana River Watershed on both sides of the border. The TRNERR has encouraged participation among U.S. and Mexican non-governmental organizations and local community members.

The California Coastal Conservancy has granted more than $200,000 for research to assess the environmental problems on the Tijuana River. Another organization involved in research and policy in this region is the State of the Environment of the Tijuana River Basin, created in the 1990s to raise awareness of the current environmental health of the basin and predictions for the future. The County of San Diego's Department of Environmental Health has been monitoring water quality at the beaches since 2000. While Mexico does not mandate this type of testing, local volunteer groups are testing the water quality in Tijuana.

The TRNERR demonstrates the efficacy of binational cooperation in the region. Cooperative projects over the past ten years have restored habitat for wildlife along the Tijuana River and estuary.

Despite this concerted and collaborative effort to resolve some of the environmental issues involving the Tijuana River watershed, serious problems still persist. Major funding to help alleviate the lack of infrastructure in the region is still not in place. Some reports show a struggle between grassroots advocacy groups and high-level decision makers. The various stakeholders in the region have different ideas about how to address the issues. Programs like the Border 2012 Program are working to bring together local communities and federal agencies to assess and address the needs of the communities; these programs are still rare, however, and many lack sufficient funding to be effective.

Water testing at Tijuana Estuary

Key Vocabulary

Outreach: Providing information or services to groups in society who otherwise might not have access to such information or services.

Restoration: The process of returning something, from a work of art to an ecosystem, to an earlier or better condition. Ecological restoration is usually targeted at ecosystems that have been degraded, transformed, or destroyed as the result of human activities.

Stewardship: Careful and responsible management of land, air, water, and biodiversity to ensure healthy and fully functioning ecosystems.

Toolbox

Summary of Activities

Students read about several organizations' efforts to resolve environmental issues in the Tijuana River watershed. The class discusses these efforts in light of actions in the rest of the border region and examine how the efforts influence U.S.-Mexico relations.

Instructional Support

See Extensions & Unit Resources, page 32

Prerequisite Knowledge

Students should have:

- completed previous lessons.

Advanced Preparation

Gather and prepare Activity Masters:

- Gather from previous lessons:
  - ***California Connections: The Tijuana River—Part 1: A Shared Resource*** from Lesson 1

Gather and prepare Materials Needed.

Gather and prepare Visual Aids:

- Prepare transparencies.

Materials Needed

A-V equipment:
Overhead or LCD projector and computer, screen

Class supplies:
- Pencils or pens

Visual Aids

Transparencies:
- **Map of the Tijuana River and Estuary**, Visual Aid #8

Duration

Preparation Time
15 min.
Instructional Time
55 min.

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

California Connections: The Tijuana River–Part 2: Working Together to Find Solutions
SM, Page 46–47
One per student

The Future of the Tijuana River
SM, Page 48
One per student

Procedures

Vocabulary Development

As appropriate, in each lesson introduce new vocabulary words using the **Key Unit Vocabulary** (Lesson 1 Activity Master).

Step 1

Redistribute ***California Connections: The Tijuana River—Part 1: A Shared Resource*** (Lesson 1 Activity Master) and review the issues surrounding the Tijuana River by asking students the following questions:

- What are some of the problems and issues surrounding the Tijuana River? (*The water quality is deteriorating due to limited sewage infrastructure in Tijuana and old infrastructure in San Diego. The growing population is putting pressure on water quality and quantity in the Tijuana River. Dumping toxic chemicals into the river, affects the fragile ecosystem.*)
- How is the Tijuana River estuary affected? (*The estuary has a great deal of wildlife and performs important natural system functions, but the increase in population is putting pressure on the ecosystem.*)
- Why are these problems considered transboundary problems? (*The river flows between the U.S. and Mexico. Both countries are responsible for the problems, and the problems affect both countries.*)

Step 2

Distribute copies of ***The Tijuana River—Part 2: Working Together to Find Solutions*** (Lesson 6 Activity Master). Place the **Map of the Tijuana River and Estuary** (Visual Aid #8) on the overhead or LCD projector. Point out where the Tijuana River flows as well as the locations of the cities of San Diego, Tijuana, and Tecate. Have the students independently read ***The Tijuana River—Part 2: Working Together to Find Solutions***.

Step 3

Distribute copies of **The Future of the Tijuana River** (Lesson 6 Activity Master) to each student. Have them independently complete the worksheet.

When students have finished their work, organize the class into groups of four. Direct the groups of four to discuss their responses to the questions on **The Future of the Tijuana River**. Allow the groups 10 minutes for discussion.

Step 4

Following the small group discussions, have volunteers from each group share their answers to the discussion questions on **The Future of the Tijuana River**. Follow the discussion of the reading by asking the following questions:

- Do the efforts mentioned in the reading address political, economic, and environmental issues? (*Yes. The work being done is addressing the political issues by creating an alliance between the U.S. and Mexico to improve the water in the Tijuana River. The two countries are working to improve the infrastructure in areas that cannot afford the improvements. The two countries and stakeholders are working to assess, educate, and clean up the river and surrounding ecosystem.*)
- How do these efforts compare with what is being done by other groups on similar issues in other parts of the border region? (*This "bottom-up" approach is similar to the Border 2012 Program. The stakeholders are trying to get a wide range of people involved in the resource management decisions.*)
- Are the United States and Mexico addressing the environmental issues equally? Why or why not? (*Mexico does not have as much money to enforce environmental laws, but they are trying to work with the U.S. to address a range of environmental issues. Both countries have much at stake in this region.*)

Step 5

Collect the copies of the readings and **The Future of the Tijuana River** to use in assessment.

Lesson Assessment

Description

This lesson returns students to the Tijuana River, which serves as a case study of an area in which environmental issues shared between the United States and Mexico influence relations between the two countries. Students demonstrate that they can understand this idea by answering the discussion questions on **The Future of the Tijuana River** (Lesson 6 Activity Master).

Suggested Scoring

Use the Answer Key and Sample Answers provided on page 108 to assess students' responses on **The Future of the Tijuana River**. Each answer is worth 10 points for a total possible score of 30 points.

The Future of the Tijuana River

Lesson 6 Activity Master

Name: _____

1. How are people addressing the environmental issues in the Tijuana River watershed?

The Tijuana River National Estuarine Research Reserve has been collecting data and creating restoration projects to improve the wetlands ecosystem. They have started a grassroots effort to educate residents and get them involved in being stewards on the environment in which they live.

2. Describe some problems in the Tijuana River watershed that still might be a concern.

Unplanned settlements and continued raw sewage dumping in the river are still concerns. Also, inadequate storage of hazardous waste as well as dumping from some maquiladoras continue.

3. With all that people are doing to solve environmental problems in the watershed, why are there still problems? What factors are affecting progress?

The problems are large and connect to the economy and politics. Restoring an ecosystem is never easy. The financial costs can be tremendous. Another reason could be that there is no agreement among stakeholders on various potential solutions. Also, resources to work on the solutions are not as abundant in Mexico as in the United States. Environmental laws on both sides of the border may need to be strengthened.

The Tijuana River

Part 2: Working Together to Find Solutions

In 2003, the mayors of Tecate and Tijuana became board members of the Tijuana River National Estuarine Research Reserve. The group aims to improve relations and management strategies on both sides of the river.

Researchers from both countries monitor water quality and wetland species. They propose ways to restore the health of the estuary. Restoration projects include constructing sedimentation basins that catch sediment and debris, as well as digging sediment from filled marshes and removing non-native plant species that threaten native plant communities. In addition, the Reserve runs a visitor center to educate the public. Representatives of the Reserve also work with Mexican agencies to train teachers on both sides of the border.

In 2006, the City of Tijuana and the State of California worked together to clean up Los Laureles Canyon. The canyon had become home to an unplanned housing development. The Mexican city and California created a sewage treatment plant and helped restore the natural waterway. They also organized riverbank cleanups. The U.S. Environmental Protection Agency also cooperates with many organizations in both the United States and Mexico to support wastewater projects in the area. The goal of these projects is maintaining the health of the border region. Recently, researchers from Mexican and U.S. universities developed a Tijuana River atlas. This atlas includes maps, photographs, and information about topography, climate, population, and land use in the Tijuana River watershed. Policymakers and planners in both countries can use this atlas to help make decisions. This binational project is a first step toward building communication and partnerships.

Tijuana Watershed–Los

California Connections: The Tijuana River–Part 2: Working Together to Find Solutions
Lesson 6 Activity Master | *page 2 of 2*

Water testing at Tijuana estuary

Current efforts to better manage the valuable resources of the Tijuana River are taking a "grassroots" approach. This means educating and working with people living in the watershed on both sides of the river. The goal is to give residents a sense of long-term stewardship, to encourage them to accept individual responsibility. Local outreach programs and restoration projects are underway in San Diego, Tecate, and Tijuana. These programs and projects encourage people to become aware of the issues that affect the river, as well as possible solutions. If the people of the Tijuana River watershed have the knowledge, tools, and support to co-exist with the natural environment, they will be able to make a difference on both sides of the border.

Gathering trash on International Coastal Clean-up Day

8 **Map of the Tijuana River and Estuary**
Visual Aid — Transparency

Map of the Tijuana River and Estuary

Credits

Editing Credits

Instructional Editors	Lori Mann
Copy Editors	Laurel Singleton
Photo Editor	Leti Sanchez

Design and Production Credits

Original Design	Karol A. Keane, Design & Communications, Inc./National Geographic Society
Graphic Production	José Munguia, Creative Services, California State University, Sacramento
Printing	Graphic Communication Institute, Cal Poly, San Luis Obispo

Content and Educational Reviewers

Content	Matthew Osborn, Ph.D.
	Aleta Zak, M.A.

Map Credits

Page 46	Border Region Map – Leti Sanchez Flores
Page 60	Border Region Map – Leti Sanchez Flores
Page 110	Map of the Tijuana River and Estuary – Leti Sanchez Flores

Photo Credits

Cover	Surfer on contaminated beach, Imperial Beach, California – Karen Kasmauski/National Geographic Society
Page 4	Mexicali, Mexico is on the left and Calexico, California is on the right – Karen Kasmauski/National Geographic Society
Page 6	Surfer on contaminated beach, Imperial Beach, California – Karen Kasmauski/National Geographic Society
Page 7	Wastewater flowing-Los Laureles Canyon, Tijuana Mexico – Kip Evans/Kip Evans Photography
Page 8	Heron eating fish in polluted river – Skip Brown/National Geographic Society
Page 9	Harvesters picking marigold flowers – W.E. Garret/National Geographic Society
Page 10	Maquiladora or assembly plant – Joel Sartore/National Geographic Society
Page 11	Municipal worker clearing trash in California – Tyrone Turner/National Geographic Society
Page 12	Cars crossing the U.S.-Mexico border – James Steidl/iStockphoto
Page 13	Officials from San Diego and Tijuana – Karen Kasmauski/National Geographic Society
Page 31	Rows of houses, San Diego – Karen Kasmauski/National Geographic Society
Page 32	Path into the woods – Kip Evans Photography
Page 34	Heron eating fish in polluted river – Skip Brown/National Geographic Society
Page 35	Oil spill going into sewer – Matthew Rambo/iStock
	Chemical waste drums – Danwer Productions/iStockphoto
Page 44	Surfer on contaminated beach, Imperial Beach, California – Karen Kasmauski/National Geographic Society
	Wastewater flowing-Los Laureles Canyon, Tijuana, Mexico – Kip Evans/Kip Evans Photography
Page 45	Ilegal dumping and wastewater-Tijuana, Mexico – Kip Evans/Kip Evans Photography
	Heron eating fish in polluted river – Skip Brown/National Geographic Society
	Trash on beach, Imperial Beach, California – Kip Evans/Kip Evans Photography
Page 47	A young boy sells newspapers at an intersection, Tijuana – William Albert Allard/National Geographic Society
Page 48	Area closed to protect endangered species at Tijuana estuary – Kip Evans/Kip Evans Photography
Page 49	A young boy sells newspapers at an intersection, Tijuana – William Albert Allard/National Geographic Society
	Farm workers harvesting – Nancy Nehring/iStockphoto

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Page 61	Tijuana watershed-Los Laureles Canyon, Tijuana – Kip Evans/Kip Evans Photography
Page 62	Downtown San Diego, California – S. Greg Panosian/iStockphoto
Page 63	A neighborhood on the outskirts of Tijuana, Mexico – Tibora Girczyc-Blum/iStockphoto
	Wastewater flowing-Los Laureles Canyon, Tijuana, Mexico – Kip Evans/Kip Evans Photography
Page 73	United States, Arizona and Mexico flags – Pamela Varga/iStockPhoto
Page 74	U.S.-Mexico border at Rio Grande River in Texas – Mike Norton/iStockphoto
Page 75	Tractor spraying chemicals on field – Mike Dabel/iStockphoto
	Water tank at a Mexican home – Christa Brunt/iStockphoto
Page 85	U.S.-Mexico border at Rio Grande River in Texas – Mike Norton/iStockphoto
Page 86	Tractor spraying chemicals on field – Mike Dabel/iStockphoto
	Water tank at a Mexican home – Christa Brunt/iStockphoto
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Page 93	United States, Arizona and Mexico flags – Pamela Varga/iStockphoto
	Oil tank washed up on beach – Brandon Rose/iStockphoto
Page 100	Trash and erosion-Los Laureles Canyon, Tijuana – Kip Evans/Kip Evans Photography
	Maquiladora or assembly plant – Joel Sartore/National Geographic Society
	Oil tank washed up on beach – Brandon Rose/iStockphoto
Page 101	Tijuana River Estuary adjacent to Pacific Ocean, San Diego – Raymond Gehman/National Geographic Society
Page 102	Great blue heron hunting – Phil Schermeister/National Geographic Society
Page 103	Storm drain leading to ocean – Paul Erickson/iStockphoto
	Water testing at Tijuana Estuary – Kip Evans/Kip Evans Photography
Page 109	Tijuana watershed-Los Laureles Canyon, Tijuana – Kip Evans/Kip Evans Photography
	Water testing at Tijuana estuary – Kip Evans/Kip Evans Photography
	Gathering trash on International Costal Clean-up Day – Tyrone Turner/National Geographic Society


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